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WHAT FORCE STRUCTURE BEST POSITIONS THE DIVISIONAL ENGINEER BRIDGE COMPANY TO SUPPORT RIVER CROSSING OPERATIONS?

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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Fort Leavenworth, Kansas
1991

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	7 JUNE 1991	MASTER'S THESIS 1 Aug 90 - 7 Jun 91

4. TITLE AND SUBTITLE

WHAT FORCE STRUCTURE BEST POSITIONS THE DIVISIONAL ENGINEER BRIDGE COMPANY TO SUPPORT RIVER CROSSING OPERATIONS?

5. FUNDING NUMBERS

6. AUTHOR(S)

MAJOR TODD T. SEMONITE

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. ARMY COMMAND AND GENERAL STAFF COLLEGE
ATTN: ATZL-SWD-GD
FORT LEAVENWORTH, KANSAS 66027-6900.

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

12b. DISTRIBUTION CODE

A

13. ABSTRACT *(Maximum 200 words)*

This study researches the positioning of the current Heavy Division Bridge Company to best support River Crossing Operations. Numerous changes in force structure, size of the force, and optimum use of engineer capabilities have raised valid questions concerning the positioning of bridging assets. New warfighting doctrine requires additional support functions being shifted to corps level. The Engineer School projects that a majority of future river crossing operations will require augmentation by corps assets. These questions lay a foundation to seriously question if the divisional bridge company should be transferred to corps level.

The thesis resolves the question by analyzing historical perspectives and the ability to support AirLand Battle-Future doctrine. Additionally, the Engineer Restructuring Initiative and Army-wide troop reductions are researched to determine their impact on the unit's ability to support river crossing operations. Three possible relationships are tested involving assignment to the divisional battalion, the corps brigade, or additional corps bridge battalions.

The study uses four independent decision matrices to conclude that the bridge company should be assigned to a Corps Bridge Battalion. This relationship best supports AirLand Battle-Future doctrine and river crossing operations supporting the heavy maneuver brigade. Recommendations concerning command and control, training and sustainment are included.

14. SUBJECT TERMS		15. NUMBER OF PAGES
ENGINEER BRIDGE COMPANY RIVER CROSSING	E-FORCE	209
		16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	

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THESIS APPROVAL PAGE

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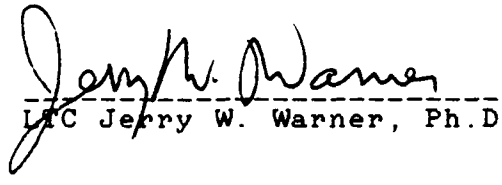
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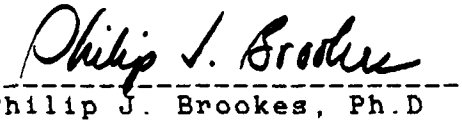
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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study include the foregoing statement.)

ABSTRACT

WHAT FORCE STRUCTURE BEST POSITIONS THE ENGINEER BRIDGE COMPANY TO SUPPORT RIVER CROSSING OPERATIONS?, by Major Todd T. Semonite, USA, 209 pages.

This study researches the positioning of the current Heavy Division Bridge Company to best support River Crossing Operations. Numerous changes in force structure, size of the force, and optimum use of engineer capabilities have raised valid questions concerning the positioning of bridging assets. New warfighting doctrine requires additional support functions being shifted to corps level. The Engineer School projects that a majority of future river crossing operations will require augmentation by corps assets. These questions lay a foundation to seriously question if the divisional bridge company should be transferred to corps level.

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ACKNOWLEDGMENT

Numerous individuals provided support and encouragement as I completed this study. To each of them I owe a special debt of gratitude. I especially want to acknowledge the assistance of some very special individuals.

LTC Robert A. Strange provided the initial impetus for consolidating some disjointed ideas and concerns into a palatable product. His oversight and counsel were essential to the completion of the this project.

The remaining members of my thesis committee were invaluable. LTC Jerry W. Warner provided numerous insights into the research process and patiently assisted with the structure of the project. LTC Steven A. Rank imparted his vast experience as an engineer and doctrinaire helping to maintain the proper focus in this endeavor.

Additionally, I want to thank the staff of the Combined Arms Training Activity and the Combined Arms Research Library who assisted me in my research. The dedication of all those concerned is unquestionably focused toward improving the U.S. Army.

Finally, I want to thank my loving wife, Connie and my children Stephanie, Alex and Will. They sacrificed our family time as well as offered moral support and inspiration throughout the year. Their patience and understanding enabled me to see this project to completion.

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CHAPTER ONE

INTRODUCTION

> For much of the past two years, a major topic of consideration in and out of the Army has been change- changes in world politics, changes in the environment, changes in lifestyles and public concerns. To remain relevant to the nation we serve, the Army and its engineers will have to not only embrace chance, but actively seek the challenges and opportunities it offers.[1]
>
> LTG H. J. Hatch
> Chief of Engineers, 1991

BACKGROUND:

The political ramifications of recent international events, combined with an increase in warfighting technology, leads me to suggest that the United States Army needs to undergo a careful self-examination. Changes in engineer force structure, revised river crossing doctrine, AirLand Battle doctrine, and a need for an Army drawdown are four variables which must be considered. Each issue will affect the army's warfighting capability during the 1990's and during the beginning of the twenty-first century. All will have a specific bearing on the engineer force.

Each of these changes have been studied in the past and are currently undergoing major revision by various

proponents of army doctrine. Fortunately, the opportunity exists now for the Army to integrate numerous concurrent changes into one cohesive, complementary plan outlining the Army of the future. One specific requirement for Army engineers is to determine the best use of the bridge company in the U.S. heavy division. What force structure best positions the engineer bridge company to support current river crossing doctrine?

Analysis of individual variables: To best understand the background of the problem, I will provide a short review of each element of change. The major issues of history, doctrine, and force structure are be explained in significant detail in later chapters as they relate to bridge company positioning.

Army doctrine is under-going significant change during the early 1990's. The development of AirLand Battle doctrine in the mid 1980's addresses all aspects of the modern battlefield. While built on the tenets of agility, initiative, synchronization and depth, the doctrine is based on the concept of linear warfare.

As new technology builds on the success of the AirLand Battle doctrine, Army leadership is considering the possibility of battles in the future being fought on a non-linear battlefield. Doctrine writers throughout the Army are currently analyzing the concept of non-linear warfare expecting to publish a new AirLand Battle-Future (ALB-F) doctrine by 1992.

Working a few years ahead of their time, engineers created a revised river crossing doctrine prior to the evolution of AirLand Battle-Future doctrine. A draft version of this new engineer doctrine released in February 1990 replaces the existing FC 90-13 developed in 1987. The doctrine expands the current four phase operation to five phases stressing the need for continued momentum out of the bridgehead.

On the force structure side of the problem, the Army of Excellence in the 1980's established a stable army force structure of 18 active duty divisions. The successful breakup of the Warsaw pact in the early 1990's, however, created the political desire throughout the United States for a peace dividend. While the final manpower levels have not been determined, many senior military officers are predicting that the army will significantly reduce in size by 1995 with only twelve active divisions.

While changes in army doctrine and force structure are significant, perhaps the change which has the most direct impact on the bridge company is the development of a new engineer force structure initiative. Professional articles, after-action reports, and lessons learned document maneuver commander's complaints about the lack of adequate engineer forces. The recent E-Force initiative, currently called Engineer Restructuring Initiative (ERI), would resolve this problem by providing heavy divisions with additional organic engineer forces. The ERI proposal would

satisfy the mobility, countermobility and survivability missions in the forward combat area. The concept provides to the heavy division a total of three engineer battalions controlled by an engineer regiment.

With several major conflicts in the twentieth century, the experiences and actions of engineer missions take increasingly more space in the history books. While actions of the bridge company are well documented i World War II and Korea, more recent conflicts are still worthy of study. Vietnam, Grenada, Panama, and Operation Desert Storm in Kuwait offer numerous insights about different types of conflict and bridge employment.

Circle of Issue Convergence: My research integrates all the existing variables of change into one, overall analysis resulting in a recommendation. To outline the complexity of the problem and review the inter-relationships, I have developed a model plotting **variables of change** against **time.** My model clarifies by graphical display the dimensions of the problem. I have named the model the "Circle of Issue Convergence."

Shown in figure 1, the model plots the variables of changing **doctrine** (both maneuver and river crossing), **force structure** (both army and engineer) and **history** against **time.** While historical events prior to 1980 will be studied, most significant events affecting the problem stem from 1980 to the present.

The ring between 1980 and 1990 reflects the Army of Excellence (AOE) of the 1980's and associated doctrine and force structure changes. The inner ring of 1990 to the future predicts several new initiatives affecting all variables which impact on the location of the bridge company. History provides several important lessons analyzing the bridge company throughout the spectrum of high to low-intensity conflict.

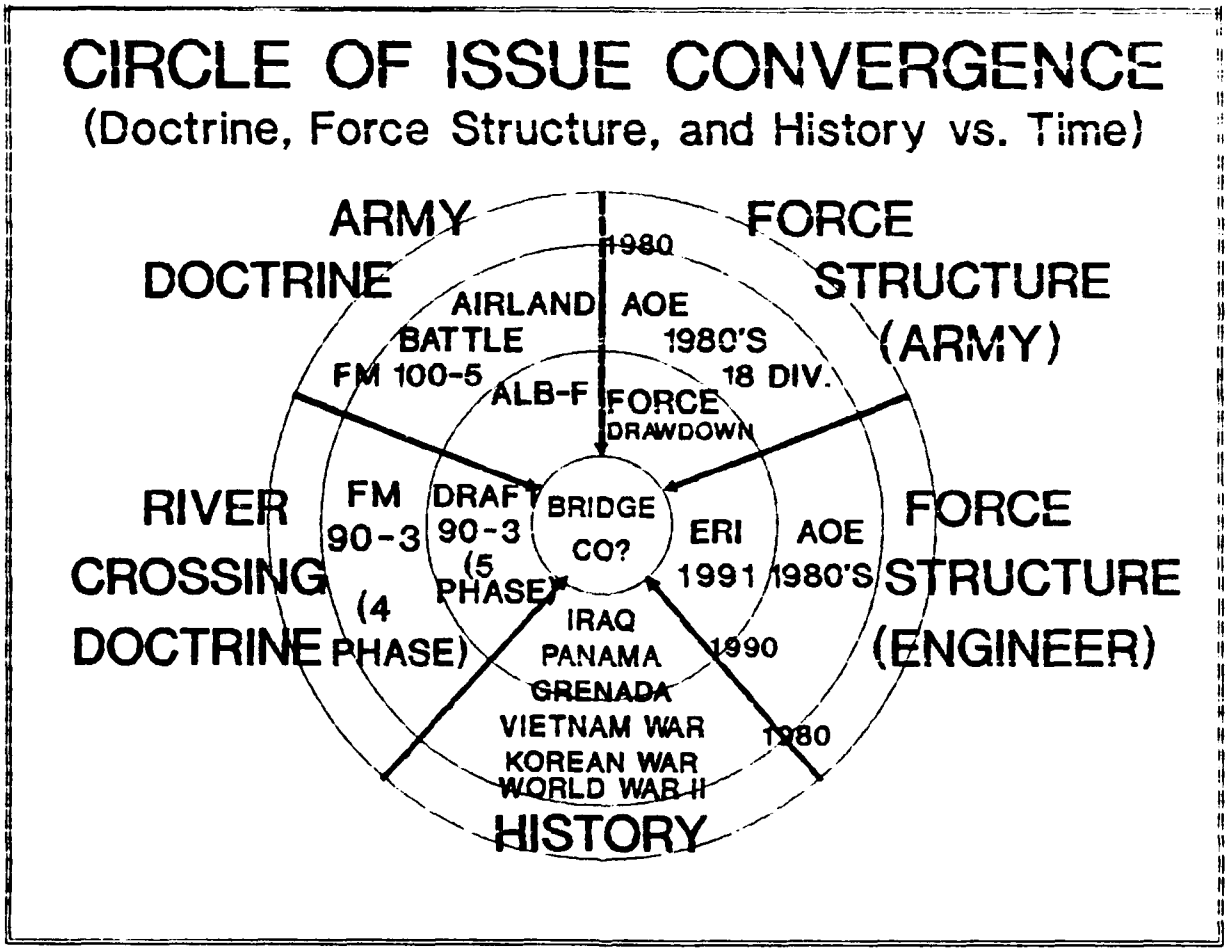


Figure 1

Located at the core of the five changing vectors is the bridge company question. While several individuals and agencies have studied the unit with regard to one, maybe two variables, now is the best time to complete a comprehensive study. It is important to outline the critical facts about each variable resulting in a recommendation based on detailed research and documented facts.

In summary, the Circle of Convergence Model highlights how I can analyze all related variables simultaneously while documenting their inter-relationships. These results will provide the answer to the optimum positioning in the force of the bridge company. While current and past experts have analyzed one or two variables and drawn conclusions, the possibility exists for my project to develop a more comprehensive solution. The result should present a recommendation which is well-founded, supportable by engineer forces, and capable of providing the best river crossing support to the maneuver division.

Two Schools of Thought: There are two schools of thought about where the divisional bridge company should be positioned. One school proposes moving the company to corps level while the other advocates leaving the company in the heavy division. Variables do not stay so forever, and the research question will be decided by the army and engineer leadership in the near future. Both options have points worthy of consideration, while also possessing associated

costs and disadvantages. My paper will fully analyze both of these options, along with one independent viewpoint. A brief overview of current thought at this stage might better outline the complexity of the problem.

Several engineer and doctrine proponents want to move the bridge company to corps level. AirLand Battle-Future requires that many current divisional capabilities be shifted to corps. This is necessary as echelons-above-division will provide assets, allocate resources, establish priorities and sustain major operations. The new AirLand Battle doctrine is based on speculation that most future river crossings will be well-planned and well-resourced operations. Engineers support the claim that a corps-conducted river crossing provides better command and control. Such an operation results in more efficient crossing sites, better mobility support, and reduced congestion.

Advocates of this proposal note that the division's ability to conduct river crossing operations is limited, even with its organic bridge company. Augmentation by corps bridging assets is required to ensure success to the maneuver brigade.

The other school of thought, primarily espoused by maneuver and some engineer commanders, proposes the retention of the bridge company organic to the heavy division. Although the requirement for this capability has not been fully analyzed, retention of the current ribbon

bridge company retains a degree of freedom of movement for the maneuver commander. Maneuver forces argue that organic bridging assets are essential for the rapid projection of combat power across water obstacles.

Although both viewpoints have advantages and disadvantages, one force structure will best accomplish the mission. Changes in the future battlefield and types of military conflicts pose many questions on the need to commit valuable manpower assets to a divisional bridge company. Recent operations in Panama, Grenada, and Operation Desert Storm did not require any bridging.

Does thinking on modern warfare produce a battlefield devoid of the need for major river crossing operations at division level? Is the 128-man divisional bridge company better used at corps level? What is the best use of the bridge company in an age of uncertainty and evolutionary change? I address each of these questions in my research. I ultimately recommend the force structure which positions the divisional bridge company to best support river crossing operations.

Ongoing Actions: Currently both force structure and doctrine experts seek answers to the questions raised here. The FORSCOM and USAREUR Commanders have already agreed to implement the Engineer Restructuring Initiative but have yet to fully address the divisional bridge company. The Combined Arms Center at Fort Leavenworth and the Engineer Center at Fort Leonard Wood have proposed some solutions but have not

conducted extensive research. Their staffs have several interesting opinions but have yet to complete a detailed analysis incorporating analytical and historical perspectives.

Division Commanders oppose the Engineer School's proposal to shift bridge companies to corps, claiming it degrades combined arms bridge training and reduces mobility.[2]

Within the next year, the Army, and the Engineer branch in particular, will undergo significant force structure changes as manpower reductions continue. Engineers must ensure that force structure and doctrine provide optimum support to maneuver brigades under AirLand Battle-Future.

Without an overall strategy, engineer units restructuring might end up in a compromise that allows only adequate mission completion. In a constrained environment, it is often necessary to settle for something other than the best. At this point in my research, however, I face numerous constraints. Conversely, I believe the optimum structure is possible and the resources, experience, and technology are available to reach that "best" solution.

One significant way to ensure success, however, is to develop a fully integrated, well researched and tactically supportable plan. A great deal of previous research, conducted under different conditions, can be tailored to assist in solving the problem. The goal of the plan would

be the creation of bridging assets providing the best possible support to maneuver units.

The plan must insure a careful balance between future Army doctrine, future engineer force structure changes and reductions in the force. The historical lessons learned from past river crossing operations provide a firm foundation, lending stability and confidence to future proposals.

PURPOSE OF THESIS: My thesis examines which force structure best positions the engineer bridge company to support river crossing doctrine. Most engineer proponents firmly believe that a crossing capability is needed. The question remains, however, whether the company should remain in the heavy division or move to the corps engineer brigade. I analyze this need against historical perspectives, AirLand Battle-Future doctrine, and the implementation of an Engineer restructuring change. The results present a proposed optimum structure which supports the engineer force of the future.

ASSUMPTIONS: It is important to insure I do not 'assume away the problem' by creating numerous, highly controversial and probabilistic predictions. My assumptions are limited to proposed actions which I expect to occur.

1. Current warfighting doctrine (AirLand Battle) will change significantly with the implementation of AirLand Battle-Future doctrine before the end of this decade.[3]

2. AirLand Battle-Future will require greater speed, surprise, and synchronization in river crossing operations.[4] Given the same organization and equipment, major river crossing operations will be more logistically unsupportable, tactically unfeasible, and manpower-intensive on the modern battlefield.

3. The Engineer Restructuring Initiative (ERI) will occur throughout active-duty heavy divisions by 1995.[5] An engineer battalion will support each maneuver brigade. The new structure attempts to address a major shortfall in the engineer capability to command and control primary battlefield missions.

4. The army will undergo a major drawdown in personnel and equipment through the next five years. The combination of manpower reductions and reduced river crossing capability will demand the most effective use of available bridging personnel and equipment.[6]

DEFINITIONS OF TERMS: Most of the military terms found in the study are from Field Manual 101-5-1, Operational Terms and Graphics, dated October 1985. Additional definitions not listed in the field manual are defined as follows:

1. AirLand Battle-Future (ALB-F): Focuses on the employment of the Army as the land component of U.S.

military power in the 21st Century. ALB-F emphasizes nonlinear operations but retains current AirLand Battle doctrine for conduct of linear warfare. The work is currently under development at the Combined Arms Center, Fort Leavenworth, Kansas, in coordination with various branch centers throughout the country.

2. E-force: E-Force is the former title for the U.S. Army Engineer School's proposed plan to restructure combat engineer support to AirLand Battle at the division and corps levels. Initially developed in the early 1980's, the concept assigns an engineer regiment (3 engineer battalions) to a heavy maneuver division.

3. Engineer Restructuring Initiative (ERI): A new name for the E-force concept described above. While development of the plan has continued since the orginal E-force concept, the plan does not fully incorporate other elements of change. For example, ERI does not address AirLand Battle-Future doctrine or the possibility of major engineer force reductions. The U.S. Army Engineer School at Fort Leonard Wood, Missouri, is currently developing the plan.

4. Heavy Division: Term used to describe both mechanized and armored divisions. Fourteen of the Army's twenty-eight divisions are classified as heavy divisions.

LIMITATIONS:

1. Future war-fighting doctrine: The results of my thesis will be based on the planned implementation of AirLand Battle-Future doctrine. I do not attempt to predict, assume, or wargame additional doctrinal changes created by technological change or political alignment. Unpredictable developments may alter possible implementation of the recommendation.

2. Limited Information: Recent military operations in Panama, Grenada and Operation Desert Storm have resulted in limited historical information. This gap in research sources limits me to use available documentation and first hand accounts. Such information may be incomplete and not portray the actual historical perspectives of the event.

DELIMITATIONS: My research on the continued requirement for a divisional bridge company, while comprehensive in detail, will exclude some related areas of study.

1. Historical analysis. I have excluded the analysis of river crossing operations prior to 1925. World War II provided the best river crossing experiences to date, all of which were well documented. The lack of highly-mobile bridges and adequate historical records limits the usefulness of operations conducted before 1925.

2. Heavy Division: I will analyze the problem with regard to a generic heavy division and not specifically address mechanized or armored-type units. Additionally, research will not differentiate between heavy divisions due

to their current geographical location. U.S. Army heavy divisions are located in different climates, train on different terrain, and have assorted mixtures of active duty and round-out maneuver brigades.

3. Economic Impacts: My research will not address the economic impacts related with the organizational positioning of the divisional bridge company.

4. Short Gap Assets: The scope of my research is limited to the positioning of the divisional bridge company and its support to major river crossing operations (Obstacles in excess of 18 meters). It will not address the maneuver unit's ability to cross short gaps with the Armored Vehicle Launched Bridge (AVLB).

SIGNIFICANCE OF THE STUDY: If current U.S. Army force structure is unsound, then the Army's ability to effectively conduct river crossings will be in doubt.

My initial impression is that there is a critical need for this research. The FORSCOM Commander, in conjunction with heavy division and school commanders, recognizes the requirement to analyze the best use of the division bridge company. The significance of the problem, combined with the absence of a current solution, intensifies the need to develop a possible solution to this issue. My efforts can assist the engineer community in the resolution of a critical force structure issue which will lead to the optimum use of engineer bridging assets.

Possible outcomes of my work could include:

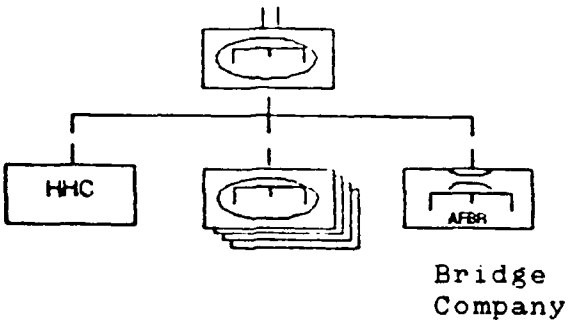
1. Best use of assigned engineer soldiers.
2. Increased deployability and maneuverability of heavy divisions.
3. Reduced vulnerability of critical river crossing equipment.
4. Increased combined arms training for deliberate river crossing operations.
5. Best use of critical bridging equipment.
6. Increased effectiveness, synchronization, and command and control in the conduct of crossing operations.
7. Improved maintenance support for bridging units.
8. Improved training opportunities for bridge crewman, supervisors, and planners.

In the conclusion, I recommend the proper organizational positioning of the divisional bridge company to the U.S. Army Engineer Center.

OVERVIEW OF RELATED ENGINEER UNITS: Provided below is a brief description and organizational chart of selected engineer units addressed throughout the paper. Although each is addressed in greater detail in subsequent chapters, this overview provides a basic understanding of the units. This background will be beneficial prior to the analysis of historical, doctrinal, and force structure issues.

a. Divisional Engineer Battalion: The divisional engineer battalion (TOE 5-145L), identical in armored and mechanized divisions, consists of a headquarters company, four combat engineer companies and one bridge company (figure 2). Normal alignment is one battalion organic to a heavy division.

Figure 2 - The Divisional Engineer Battalion[7]



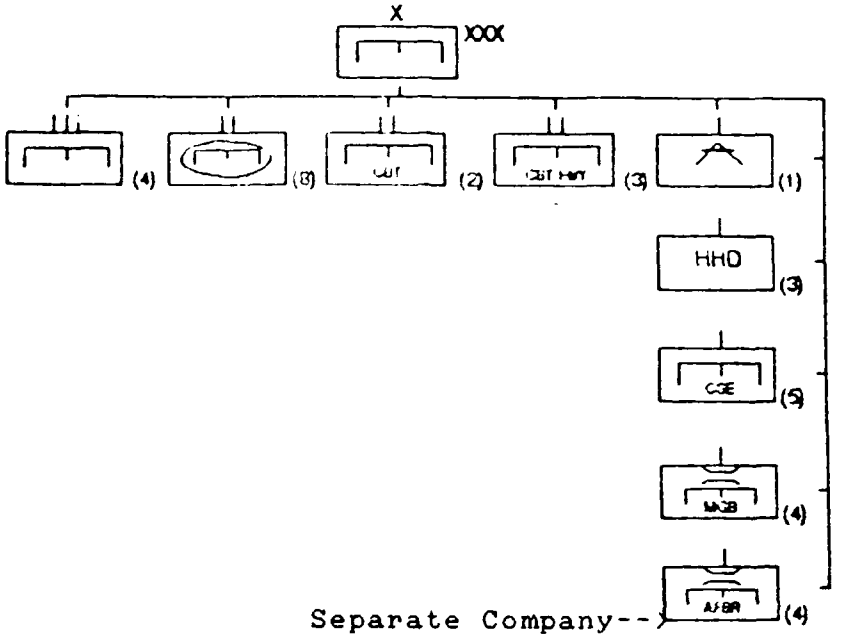
The mission of the unit is to increase the combat effectiveness of the heavy division by accomplishing mobility, countermobility, and survivability tasks. The battalion commander also serves as the division engineer.

b. Divisional Bridge Company: The bridge company (TOE 5-145L) consists of a company headquarters, two bridge platoons and a maintenance section (see figure 2) Each company is equipped with 144 meters of ribbon bridge equipment used to make either four class 60 rafts or one 144 meter class 60 float bridge.

The company provides the technically trained personnel and equipment to maintain, load and transport, erect, operate, and disassemble tactical stream crossing equipment in the division area of operations.

c. Corps Engineer Brigade: Each corps contains an engineer brigade which operates in the combat zone and provides forces forward to weight the battle (figure 3).

Figure 3 -The Corps Engineer Brigade[5]



The mission of the engineer brigade is to command assigned and attached units and coordinate engineer activities. The unit plans and coordinates the operation of engineer units engaged in combat support, construction, and rehabilitation of facilities in support of a corps.

Although primarily a command and control organization, a brigade consists of a headquarters company and two to five attached engineer groups. Separate float bridge companies are also assigned to the headquarters to assist combat engineer forces with river crossings.

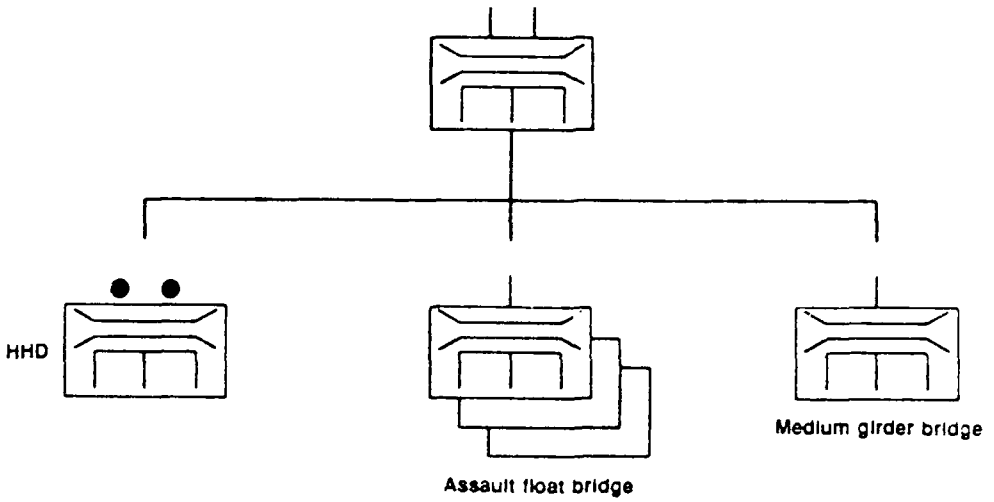
d. Corps Separate Float Bridge Company: Similar to its counterpart in the division, the separate float bridge

company (TOE 5-493L100) provides supplemental bridging for corps or divisional crossing operations (see figure 2). The unit is capable of constructing two Class 60 rafts or one 72 meter bridge.

The mission of the separate company is similar to the divisional bridge company. It provides personnel and equipment to transport, assemble, and maintain the ribbon bridge. By immobilizing bridge loads, transporters are capable of hauling engineer material for combat missions.

e. Corps Bridge Battalion: The bridge battalion contains 60 percent of a three-division corps' float bridge assets and all of the tactical fixed bridge and supplementary bridge assets (See figure 4).

Figure 4 - The Corps Engineer Bridge Battalion[5]



The unit includes three separate float bridge companies with a total of 640 meters of organic ribbon bridge. A medium girder bridge company provides 122 meters of fixed bridging.

The battalion headquarters provides command and control over bridging operations with the potential to conduct all corps brid ing operations. It is capable of providing staff engineers to assist in the planning and conduct of deliberate river crossing operations of maneuver units. Currently the active force contains only one bridge battalion. It is located in Europe with assignment to a corps engineer brigade.

DEVELOPMENT OF FEASIBLE OPTIONS: The result of my study will be a recommendation of where the bridge company should be located. To assist in this process, I developed three possible options early in the research process. I recommend that the reader keep these alternatives in mind throughout the explanation of factual background information provided in Chapters 4 through 6. Chapter 7 analyzes the three options using established criteria and provides a recommendation.

The rationale for developing the options is comprehensive yet straight forward and logical. Two options involve moving the company to corps and one keeps it at division level. The framework for the corps option is the ERI proposal developed by the Engineer School. The second corps option presents a new command and control relationship in the corps brigade. The final division option simply maintains the status quo. These options do provide a mix of the necessary variables of this problem with each possessing

individual strengths and weaknesses. Each option will be discussed in greater detail in Chapter 7, Evaluation of Options.

OPTION 1: Retain the Divisional Bridge Company.

This option allows many of the same capabilities and limitations found in the current structure. With the implementation of the Engineer Restructuring Initiative, the company would remain under control of the organic engineer regiment and be attached, as required, to engineer battalions organic to supporting maneuver brigades. Divisional engineer battalions would conduct the river crossing operations.

OPTION 2: Consolidate Divisional Bridge Companies in the Corps Engineer Brigade.

This option shifts the unit to corps level as a separate company under the engineer brigade. The control of river crossing operations would be the responsibility of the divisional engineer regiment with the required number of bridge companies attached in a support role. In wartime, selected brigade units would be task-organized to activated reserve groups for command and control.

OPTION 3: Assign company in a newly formed Corps Bridge Battalion organic to the Corps Engineer Brigade.

This option makes the bridge company organic to a corps bridge battalion which controls 4 to 6 bridge companies. The bridge battalion would be responsible for the command and control of division river crossings and use its

organic assets as needed. This option requires the creation of up to four battalion headquarters elements.

CONCLUSION: In Chapter One, I have presented the background of the problem, stated assumptions, defined organizations, and developed options. Before a historical, doctrinal and force structure analysis can begin, however, it is important to review the current body of knowledge. Chapter Two provides a detailed review of literature already completed on related subject matter from which the study can expand upon.

CHAPTER ONE - ENDNOTES

[1]Henry J. Hatch, "From the Chief of Engineers," Engineer Officer Bulletin No. 12 (January 1991): i.

[2]Vern Lowery, interviewed by author, telephone conversation, Fort Leonard Wood Department of Combat Developments, 15 October, 1990.

[3]Stephen Silvassy, "AirLand Battle-Future, The Tactical Battlefield," Military Review Vol LXXI (February 1991): 3.

[4]Ibid.

[5]Daniel R. Schroeder, "Engineer Update - From the Commandant," Engineer Officer Bulletin No. 12 (January 1991): ii.

[6]Gordon M. Wells, "U.S. Army River Crossing Doctrine and AirLand Battle-Future," (School of Advanced Military Studies Monograph, U.S. Army Command and General Staff College, 1990), 15.

[7]Richard G. Stowell, "Son of E-Force," Engineer Officer Bulletin No. 12 (January 1991): 9.

[8]Ibid, 10.

[9]Paul G. Munch, "The Engineer Bridge Battalion," Engineer, Vol. 20, No. PB 5-90-1 (March 1990): 14.

CHAPTER TWO

REVIEW OF LITERATURE

> Not one water barrier will be found either in Europe or Asia, that our ground forces will be unable to take in stride. They have the necessary technical means for this, and in the course of their exercises, our fighting men are successfully mastering the various techniques for surmounting the most complicated water barriers.[1]
>
> Marshall Chuikov
> Commander, Soviet Ground Forces, 1963

OVERVIEW:

Chapter two of my thesis provides a review of literature that pertains to or has an impact on the divisional bridge company and its mission. The literature I reviewed for my thesis provides the basis for the analysis conducted in the remainder of my study. I identified four components of military arts and science research needed to compile my thesis. They are:

- Historical Perspectives
- Army Warfighting Doctrine
- Engineer River Crossing Doctrine
- Engineer Force Structure

These broad categories complement the supporting methodology and form a basis for chapters four, five, and six. As a result, chapter two is a synopsis of the current body of information available on my subject.

HISTORICAL WORKS:

Since there has been limited prior research on the positioning of the divisional bridge company, I extracted required information from historical works, concentrating on famous river crossings. I uncovered a wealth of information in after-action reports and operations orders of the divisions and corps involved in the crossings. Official U.S. Army historical documents and numerous articles in periodicals provide detailed information on the planning, conduct, and success of bridge companies supporting major river crossings.

World War II literature provided the most completely documented operations and is invaluable in my research of large crossings conducted against a sizable force. Coll's U.S. Army in World War II - The Corps of Engineers provided valuable insight into force structuring decisions made before the war. I also researched the Combat Studies Institute (CSI) Battlebook series completed by a staff group of CGSC students in 1984. All the works are particularly scholarly, detailed and accurate, especially the volume on the Rhine River.

Several articles in Engineer and The Military Engineer discuss advances in bridging capability and

highlight major accomplishments of treadway bridge companies. Stanley Murphy's article in Engineer on tactical doctrine and equipment greatly influenced my opinion of responsive bridging support. William Baldwin's article, also located in Engineer, provided important insight on Patton's command and control of the Rhine crossings.

I found Appleman's official history of the war, The United States Army in the Korean War, particularly enlightening and easy to read. While the Kumho crossing is only briefly discussed, the work offers an insight on the organization of engineer units and support offered to maneuver units. Crucial to my understanding of crossing conducted during the Korean War are several articles written by engineers present during the operation. COL Itschner and LTC Hyzer were both key players in the Kumho crossing and discuss their challenges and successes in articles published in the Military Engineer.

Several analytical works, while unpublished, attempt to relate current doctrine, tactics, and procedures to previous river crossing operations. As a result, detailed research outlined several critical fundamentals which were responsible for the success or failure of river crossing operations. I found both the Masters of Military Arts and Sciences (MMAS) theses and the School of Advanced Military Studies (SAMS) monographs especially helpful. Although few in number, these works are a wealth of

information on research sources and offer a candid review based upon a thorough study and analysis of these sources.

Army publications complete the literary spectrum. Original Table of Organizations (TO&E's), pamphlets, field manuals, and command newsletters provided information on organizations, equipment, and manning levels. I relied heavily on these original documents as I found that secondary and tertiary sources often distorted the facts to further promote a particular viewpoint.

ARMY WARFIGHTING DOCTRINE:

My research topic involves the published doctrine of AirLand Battle and the unpublished concept of AirLand Battle-Future. Army field manuals outline current doctrine, Army 'White Papers' conceptualize AirLand Battle-Future, and numerous periodicals and articles attempt to interpret, reinforce, or challenge both doctrines.

An understanding of AirLand Battle must begin with Field Manual 100-5, Operations. This capstone manual provides a broad overview of the army's doctrine and outlines the tenets and imperatives of AirLand Battle. Offensive and defensive tactics, techniques and procedures complete the description of how the army plans and conducts operational and tactical missions.

Several supporting field manuals are derived from FM 100-5 including Corps, Division, Brigade, and Engineer Operations Manuals. While all of these build on the framework established in FM 100-5, they are general in

nature and provide little specific information on the role of the divisional bridge company in river crossing operations.

Since the AirLand Battle-Future concept developed in the late 1980's, the Army has not yet published any major works on the subject. The series of AirLand Battle 'White Papers' provides an excellent overview of the concept, but lacks details on how armies will conduct operations on future non-linear battlefields. I found interviews and discussions with members of the AirLand Battle-Future working group to be particularly informative. The engineer representatives of the group offered their viewpoints on the concept as they relate to my research question.

The development of a new army warfighting doctrine has produced numerous articles. Engineer, Army, The Military Engineer, Parameters, and other magazines have brought forward supporting and conflicting opinions of AirLand Battle-Future doctrine, environment, and application. Combined, they give a variety of opinions and facts which provide an analysis of the Army's current and future doctrine. Several articles in Military Review are significant as many of the authors hold senior army leadership positions. These officers relate the changes in emerging warfighting doctrine to force structure and political factors facing the Army as well as the changing nature of the threat.

RIVER CROSSING DOCTRINE:

The best source of information concerning river crossing doctrine and capabilities is the series of engineer field manuals. FM 5-100, Engineer Combat Operations serves as the branch's capstone manual providing an overview of mobility, countermobility, and survivability missions. Though it deals in generalities, the manual outlines basic engineer doctrine and introduces primary missions and organizations.

I found that FM 5-101, Mobility, provides the additional information needed to gain a broad understanding of gap crossings. The manual discusses history, site preparation, and command and control of gap crossings but does not adequately explain deliberate river crossings. While the manual offers some specific information helpful in establishing and evaluating criteria, it still lacks the detailed technical information necessary to address my issue.

Field Manual 90-15, River Crossing, was superseded by a coordinating draft of Field Circular 90-13 - Counterobstacle and River Crossing Operations in 1987. The field circular was published by the U.S. Army Command and General Staff School with the intent of establishing generic procedures for crossing all obstacles. The work is disorganized and does not address specific procedures in a deliberate river crossing. The manual outlines current

crossing doctrine employing a four-phase operations focused on terrain, not forces.

The February 1990 coordinating draft of FM 90-13, Combined Arms River Crossing Operations solves many of the concerns I raised over previous manuals. The draft clearly outlines fundamentals, concepts, planning considerations, and technical data for river crossings. I found the work detailed, concise, easy to understand, and in coordination with other Army and engineer field manuals. The doctrine focuses on forces rather than terrain and introduces a fifth phase, Attack out of the Bridgehead.

Articles on river crossing operations appear both in periodicals and other unpublished sources. Engineer and the Military Engineer have several articles addressing river crossing exercises and the uses of technology to assist in the crossing effort. I did not find many works which specifically addressed the problems with river crossing doctrine, techniques, or procedures.

I found that several MMAS theses and SAMS monographs question the validity of previous river crossing doctrine and techniques and identify numerous deficiencies that have not been addressed in other publications. One of these works was particularly important to my topic as it established a relationship between the two emerging doctrines. The SAMS monograph by Major Gordon Wells, U.S. Army River Crossing Doctrine and AirLand Battle-Future assists in my analysis of the bridge company by concluding

that the 1990 river crossing doctrine does support AirLand Battle-Future doctrine.

FORCE STRUCTURE ISSUES:

FM 5-100: Engineer Operations, available Tables of Organizations (TO&E's) and river crossing and maneuver field manuals provide a firm understanding of the capabilities, limitations, and equipment of the current divisional and separate corps bridge company. To gain an accurate understanding of future force structure proposals, I was limited to Engineer Branch School studies and current articles in Engineer and the Military Engineer.

The Engineer Structure Study, conducted by a study cell from Fort Leavenworth, is the most current and detailed analysis of the Engineer Restructuring Initiative (ERI). The study determines which engineer force structure alternative maximizes responsive and flexible support to create a more lethal maneuver corps on the AirLand battlefield. The work creates an effectiveness model to analyze the impact of improved force structure on engineer operations. Although detailed in combat operations, the study only mentions river crossing operations and bridge company organizations.

Professional journals and periodicals bridge the gap between concepts stated in the Engineer Structure Study and the combat realities experienced in the field. The PERSCOM Officer's Bulletin and Engineer magazine frequently published insights from senior engineer leaders describing

the implementation of the new initiative. Because the ERI concept, formally known as E-Force, has existed for almost ten years, a wide assortment of articles have been published by various authors with divergent backgrounds and experiences. Engineer and Military Engineer offer articles which analyzed the advantages and shortcomings of ERI from viewpoints of officers familiar with field conditions.

Members of the Force Structure Cell, Combat Development Branch of the Engineer School are particularly helpful in discussing the relocation of the bridge company. I interviewed subject matter experts to gain an insight into the rationale behind proposed force structure changes.

The final source of information concerning bridge company positioning was obtained from the faculty, staff, and students of the U.S. Army Command and General Staff College. I gained valuable insight on the practicality of my proposals and used their wealth of experience and knowledge to assist in my evaluation process. Without this interaction, my thesis would have been missing a certain depth provided by their concern for the research problem and the Army in general.

CONCLUSION:

All sources mentioned in this chapter and in the bibliography are available from the Combined Arms Research Library at the U.S. Army Command and General Staff College (USACGSC).

I used several different types of literary sources in obtaining factual information for my thesis. Most works relating to the topic were completed prior to the development of AirLand Battle-Future doctrine, emerging river crossing doctrine, the Engineer Restructuring Initiative, or the requirement to reduce the size of the army. I have the advantage of researching this issue at a time when four previously studied independent events are occurring simultaneously. As a result, my task is to analyze and interpret those elements of information which are still valid and synthesize them into a new and relevant recommendation.

In light of rapidly changing doctrine, an abundance of factual material, and a requirement on my part to draw logical conclusions from published, readily available material, the absence of literature will not impede my research effort. It is time for an independent rational approach to answer a question which has not been analyzed in depth for several years.

CHAPTER TWO - ENDNOTES

[1]Lieutenant Colonel Frederick C. Turner, "Soviet River Crossings," Military Review, (September 1966): 34.

CHAPTER THREE

METHODOLOGY

> The question is whether...judgments have to be made in the fog of inadequate and inaccurate data, unclear and undefined issues, and a welter of conflicting personal opinions, or whether they can be made on the basis of adequate, reliable information, relevant experience, and clearly drawn issues.[1]
>
> Alain C. Enthoven
> Assistant Secretary of
> Defense, 1965-1969

OVERVIEW:

In Chapter Three I develop the thesis methodology. I establish appropriate research questions and determine the most effective procedure for my analysis. The chapter includes a discussion of the process by which I answer the questions and correlate the material. I develop evaluation criterion allowing each bridge option to be subjectively analyzed and measured. I outline a decision-making tool, the weighted decision matrix, which allows me to effectively synthesized all criterion resulting in an overall solution. This evaluation forms the basis of my conclusions and recommendations concerning the disposition of the Divisional Bridge Company.

METHODOLOGY ANALYSIS:

My plan of attack for addressing the research question involves the development of a three tier structure of questions leading to a single answer. A listing of subordinate and tertiary questions forms a basis from which I explain the project's methodology. This framework of questions is **not** meant to serve as evaluation criteria for options developed in Chapter 1. The questions are a result of my personal 'brainstorming' meant to form a baseline outline of inter-related factors. My research expands and interprets these factors resulting in an overall recommendation.

SUPPORTING QUESTION TIER:

TIER 1: Is the Engineer Bridge Company still required in the U.S. Army Heavy Division?

- **Tier 2A:** From a historical perspective, where should the Bridge company be positioned organizationally?
  - **Tier 3A1:** Heavy division conflict (World War II)?
  - **3A2:** Mid intensity conflict (Korea)?
  - **3A3:** Low intensity conflict (Vietnam/Panama/Grenada/Desert Storm)?
- **Tier 2B:** Where should the Bridge company be positioned to support AirLand Battle-Future Doctrine?
  - **Tier 3B1:** Deployability and maneuverability of Heavy Division?
  - **3B2:** Success on the non-linear ALB-F Battlefield?
  - **3B3:** Effectiveness in conduct of river crossing operations.
  - **3B4:** Vulnerability of critical river crossing assets?
  - **3B5:** Utilization of critical bridging assets?

Tier 2C: Where should the Bridge company be positioned to complement the emerging Engineer Restructuring Initiative?

Tier 3C1: Utilization of assigned engineer soldiers?
3C2: Training opportunities for bridging MOS's.
3C3: Combined arms training for deliberate river crossing operations?
3C4: Maintenance support impact on engineer units.
3C5: Capability to support future bridging developments.
3C6: Need for Mobility - Forward positioning vs. protection.

I use several research techniques to answer questions at the third tier. My analysis of those answers results in a defensible answer to a second tier question. I answer the research question based on my analysis of second tier questions.

I use publications documenting historical river crossing operations to answer historical questions from tier 3A. Some use of after-action reports or personal interviews are required in more recent conflicts (question 3A3).

Tier 3B and 3C questions are answered using existing doctrine and publications as well as opinions received from soldiers and leaders in the field. Data is collected on maneuver support and sustainment issues from combined arms officers in the Command and General Staff College (CGSC) with heavy division experience . Information on command and control relationships and river crossing doctrine is gathered through informal interviews with engineer officers both in CGSC and in field units.

DECISION-MAKING THEORY:

Hopefully, in all decisions, the decision-maker has in mind a well-defined and well-understood objective. The decision-maker must establish desired goals and determine, in my case, what positioning option of the engineer bridge company best enables the objective to be achieved.

This decision-making exercise seeks to subjectively rate each of the three strategies in their ability to satisfy my overall objective. Because of the intangible nature of the problem statement and associated variables, I must first devise a rating system and decision-making model. It is important to select a decision-making tool which is easy to use, accommodates all critical factors, and supports the recommendation with solid rational.

The characterization of a decision's quality should be based primarily on an evaluation of the method used to arrive at the decision.[2] The basic premise of the decision-making theory is that the proper application of a sound analytic process to the bridge company structuring problem will ensure consistent and defendable results.

I use quantitative techniques in an effort to clearly define the issues and alternatives. This method allows the decision-maker to make a well-informed judgement from an accurate summary of relative facts. The quantitative techniques are not and must never be considered as a substitute or solution to decision-making.[3] It is important to make the best decision based on the insight

provided from the decision-making aid, not strictly on the results of the numbers.

DECISION-MAKING MODEL:

General: I use a decision matrix in selecting the best option for the bridge company. This matrix facilitates analysis of a decision by providing a logical format for arranging various alternatives, criteria, payoffs, and rankings.

Unweighted Matrix: While there are various methods of solving decision matrices, in this study I use a common technique capable of accommodating numerous criterion of differing, and most-likely non-quantifiable, payoffs. I have listed alternatives in vertical columns and evaluation criteria in horizontal rows. Because the criteria payoffs are measured in different types of units (hours of response time, command and control advantages, utilization rates), any combination of these numbers is meaningless. The easiest way to use the payoffs is to assign relative values from 1 to 3 (3 options) to each payoff in a particular column. The bridge option which I consider to be best for a given criterion is assigned a "1" while the least desirable option receives a "3". I subjectively evaluate each option with respect to a given criterion in Chapter 7. Based on the suitability of that option to the criterion under study, I assign a relative rank.

The relative values remove the difference in units between the criteria with all numbers signifying a magnitude of achievement. Since the smaller assigned values indicate preferred strategies, the smallest sum of values indicates the best strategy.

Weighted Matrix: The technique above is well suited when parity exists between all criterion. This is not the likely case with the bridge company problem. For example, most Army officers with division experience would agree to the significant importance of **RESPONSIVE SUPPORT** to the heavy brigade. **MAINTENANCE CO-LOCATION** considerations would probably seem a much lower priority.

The difference of importance in various criteria is manipulated by introducing weights into the matrix. For example, I might assign a high weight of "4" to **RESPONSIVE SUPPORT** and a corresponding low weight of "1" to **MAINTENANCE CO-LOCATION**. By multiplying the assigned weights for each criterion row times the relative rank for each option, an overall option total is calculated. The smallest overall total indicates the best option. The weights magnify the differences between the relative values in the appropriate columns, giving the weighted criteria more impact on the differences in the overall total.[4]

Special-Interest Weighting: It is important to insure that the methodology and subsequent thesis conclusions are well-founded yet responsive to the reader's need. As earlier stated, the decision-matrix is a tool to

allow the decision-maker a full, accurate summary of all the relevant facts. Because both the assignment of ranks and weights is highly subjective, my study provides the reader with more than one perspective on the interpretation of the assembled facts.

To accomplish this objective, four decision-matrix weightings are depicted in the Chapter 7 evaluation portion. In addition to my personal opinion, the viewpoints of three special-interest group's are represented.

Each weighting version allows for 16 'Importance Points' to be allocated against the eight possible criterion. '0' to '4' is possible with a an assignment of '0' assigning no value to the criterion and '4' representing the most significant criterion. An assignment of '2' to each criterion results in an unweighted matrix. An unweighted matrix is also provided in Chapter 7 to serve as a control baseline.

Because the ranking of options within a given criterion is a complex subjective task, I do not solicit ranks from the special interest groups. As a result, my rankings are injected to the matrices and multiplied by the unique weights of each group. A description of the four weighting categories and related information on their data acquisition is provided below.

A. Author's Weights: These weights represent my viewpoint after gaining a thorough understanding of this thesis problem. My rationale for individual weights is

included in the description of evaluation criteria in this chapter.

B. CGSC Engineer Officers' Weights: The associated weights for this category come from engineer officers assigned to the 1990-1991 Command and General Staff College. Although knowledgeable of engineer organizations and river-crossing doctrine, the twelve officers received only a cursory briefing on the related problem. Their averaged responses results in a set of weights representing the officers collective attitude.

C. CGSC Maneuver Branch Officers' Weights: The weights of this special interest group represent twelve officers from the infantry, armor, and field artillery branches. Their knowledge of river crossing operations and engineer organizations is less than that of the engineer officers. This group, however, would be expected to better understand the needs of the maneuver brigade in accomplishing smooth river crossing operations. Like the engineer group, I provided these officers only a cursory briefing on the background of this thesis.

D. Thesis reader's assigned weights: While it is interesting to know what the author, engineer and maneuver officers' opinions of various criteria, the reader may disagree with published rankings and weights. To resolve this concern, I present a method for the reader to assign his own weights and calculate the corresponding optimum solution. This interactive capability is best suited to

altering or completely changing the **weight** values. If the reader desires to change options, criteria, weights, or ranks, a separate decision matrix is provided . This is best supported by photo-copying the page from the published thesis and adding, deleting, or modifying selected information.

My intent is to provide the background historical, doctrinal, and force structure information needed to analyze the problem. Although my recommendation is offered in the conclusion, the reader is free to use the developed model to interpret or verify the findings as he desires.

DEVELOPMENT OF EVALUATION CRITERIA:

It is important to establish those factors which are used to evaluate the various bridge company options early in my research. By understanding what elements of river crossing operations are important, in a historical, doctrinal, and force structure context, I can better interpret the impact of actions outlined in the next few chapters. Simply stated, it is critical to know the rules before the game is played.

Below I have listed a detailed description of evaluation criteria. Associated weights delineate the relative importance of each criterion. While many additional factors impact the ultimate decision, the eight criterion suffice to cover the many complexities of this problem. I have selected criterion which incorporate the tenets of AirLand Battle (Current and Future): agility,

initiative, depth, and synchronization. Additionally, my selected criterion represent key aspects of the Principles of War and the imperatives of the latest river crossing doctrine. I incorporate varying branch perspectives, from the supporting engineer commander to the supported maneuver commander. I conclude each description with on my decision of successful option compliance with the criterion.

The criterion I have chosen represent the most important aspects of my problem. When properly used to evaluate my three structuring options, I am confident a defendable yet workable solution to the bridge company positioning problem will result.

1. **RESPONSIVE SUPPORT** - **Discussion**: Supporting combat units across water obstacles is one of the most critical mobility tasks. Success on the battlefield is not dependent solely upon the effective or efficient utilization of bridge assets. The responsiveness of that support is equally as important as its effectiveness and more important than efficiency.[8] The criterion element of **RESPONSIVENESS** considers the ability of the three bridge options to rapidly accomplish the river crossing mission.

The co-location of bridge assets at corps level leads me to believe that support would be inherently unresponsive. The significant dispersion of today s modern battlefield could result in substantial travel times to move corps assets to the forward edge of the battle area (FEBA). As a result, maneuver divisions unexpectedly encountering a major

obstacle would often need immediate corps augmentation to conduct a crossing. Most tactical situations would place the maneuver unit in jeopardy if it had to wait for corps assets to conduct a tactical movement to the crossing site.

Most river crossing operations are planned at corps level. As a result, support requirements should be known well in advance and possible river obstacles highly predictable. Corps bridge company support could be readily available when and where it is needed. Units would be tasked organized to the divisions, co-located with the maneuver elements, and become just as responsive as divisional engineers at the crossing site.

At the division level, support capabilities organic to the division are normally more readily available than corps assets.[6] They can rapidly respond to unexpected water obstacles on a moments notice. Even if the crossing requires additional assets, initial divisional ribbon bridge rafts can transport critical assault vehicles. Maneuver units could secure the far shore and not require the division to sit and wait.

Weight: Due to the significant importance of speed, momentum, and agility of today's battlefield, this criterion is assigned an importance factor of "4".

Decision: I will rank the options on their ability to provide the most responsive support to the maneuver brigade.

2. **OPTIMUM UTILIZATION - Discussion**: Float bridge assets, regardless of where they are located, are a limited and valuable commodity. The premium placed upon mobility by AirLand Battle doctrine places a similar premium upon gap crossing capabilities.[7] This especially applies to those limited bridging units in which ribbon bridge equipment is located. It is clearly in the best interest of both engineers and maneuver units to establish a force structure which insures the optimum utilization of float bridge assets.

Current divisional ribbon bridge companies can cross a wet gap of 144 meters in width. While current doctrine recommends at least two crossing sites per maneuver brigade axis, it is possible to cross a division in column on two bridges. Simple arithmetic would limit division crossings using organic assets to 72 meter wide rivers.

Engineer laboratory results from the Waterways Experiment Station (WES) calculated the anticipated crossing requirements for the European theater. According to the WES data, the organic divisional float bridge assets could be effectively used on 50% of the wet gaps wider than 18 meters (AVLB span).[8] This could be done independent of additional assets from corps.

This data conversely meant that 50% of the time the division would not be capable of crossing an obstacle greater than 72 meters without corps assets. The simultaneous crossing of a corps or army over a major

gap would require all bridge assets from both the corps and the division. I use a historical vignette in Chapter 4 to show that the consolidation of bridging assets was essential to Patton's 3rd Army crossing of the Rhine River in 1945.

Retention of bridging assets at division level would limit the corps commanders flexibility to mass assets for the main effort and conduct a rapid crossing. Bridge assets remaining with reserve or follow-on divisions would prevent optimum utilization of all available resources.

In evaluating the three bridge options with regard to this criterion, I will subjectively make some tough decisions. I will decide which option allows the best chance of resourcing divisional crossing with the required assets? I will consider that while corps consolidation might weight a main effort, it might also prevent bridging assets from being assigned to the supporting division.

Weight: I assign the weight of '2' to this criterion based on the importance of properly allocating and using available bridge equipment.

Decision: I will select the option which insures the optimum utilization of available bridging assets.

3. **COMMAND AND CONTROL - Discussion:** One of the essential elements of successful river crossing operations is effective command and control of all aspects of the operation. In addition to engineer bridging assets, the command structure must address the inter-relationships of site security, crossing of the assault force, and dispersion

of maneuver elements. Additionally, traffic control, operation sustainment, and synchronization with maneuver units requires detailed attention at all command levels. More than any other mobility task, gap crossing involves the management of combat power, space, time, and terrain.[9]

In a major corps river crossing operation, the Crossing Force Commander (CFC) is normally the commander of an engineer group from the corps engineer brigade. He coordinates all division and corps assets into a synchronized plan supporting the overall corps objective. He works closely with the Crossing Area Engineer (CAE) who is responsible for the crossing of a brigade crossing area. The CAE is normally a battalion commander of the corps combat battalion or bridge battalion.

The role of the divisional engineer battalion commander is not clearly delineated and normally depends on the tactical situation. Smaller crossing operations might prohibit the assignment of corps engineer commanders to control the operation. Separate bridge companies would be assigned to the division to provide assets and assist in the crossing. If corps engineer command and control headquarters do not accompany task-organized bridge companies, then the division's engineer battalion commander becomes the Division Crossing Force Engineer.

The centralization of ribbon bridge assets at corps level would bring into sharp focus the delineation of responsibility concerning the provision of engineer support

for river crossing operations.[10] Corps engineers would be responsible for engineer command and control and be able to refine and train on their involvement in greater detail. The fact that current doctrine requires a mixture of equipment and control elements from both division and corps means that centralization and unity of command would allow a sharper mission focus.

The decision-maker must analyze the impact of improved command and control in complex river crossing operations. Division engineer involvement allows more flexibility at the tactical level and closer relationships with the habitually associated maneuver unit. Corps command and control allows better synchronization of all corps assets (follow-on maneuver units, traffic control, etc) and would be expected to conduct a smoother crossing.

Weight: Command and control is one of the most important aspects of the crossing operation. I assign this criterion an importance weight of "3".

Decision: I will select the option that, regardless of organizational level, best integrates combat power, time, space, and terrain to provide a well organized operation.

4. BRIDGE VULNERABILITY - Discussion: Current engineer and maneuver doctrine would predict that the division bridge company would be normally found closer to the FEBA than if it were a located at corps level. This prediction leads me to conclude that divisional bridge equipment would be more vulnerable to enemy fire. With both

divisional and corps bridging equipment being a scarce and invaluable asset, this issue is worthy of consideration.

The decision-maker must weigh the impact of increased vulnerability when advocating the location of the engineer bridge company at the non-divisional level. In determining the weight of this criterion, another important factor is considered. The location of the bridge assets (forward and more vulnerable vs. rearward and more protected) should be determined more by the tactical situation than by the organizational level at which the bridge company is found.[11]

Weight: Because vulnerability is largely dependent on the tactical situation, I assign a weight of "1" to this criterion.

Decision: I will select as the best option the force structure which minimizes the exposure window of bridge assets to enemy fire.

5. TRAINING - Discussion: The conduct of training involves two critical areas. These include the collective training of soldiers assigned to the bridge company and the familiarization of maneuver units using bridging equipment and crossing plans.

Any consolidation of bridging units would allow economies of scale in the conduct of collective unit bridge training. Bridge crewmen (MOS 12C) are low-density career fields. As a result, the ability to provide satisfactory training of the individual soldier, squads, and platoons is often limited in the maneuver division. If bridge companies

were combined at corps level, their co-location could easily rectify this problem.

While assisting the bridge unit, consolidation outside division could adversely affect the ability of maneuver units to conduct combined arms training on bridge equipment. Perhaps more significant than the inability of a M1 or Bradley driver to cross a ribbon bridge is the degradation of maneuver staffs to plan and train on river crossing operations. The sharpened focus that would occur within engineer units outside the division may be accompanied by an unintended and unfortunate reduction in emphasis within the division.[12] The key to successful combined arms training is the recognition by maneuver commanders at the division and brigade level that river crossings are complex mission essential tasks requiring the conduct of periodic, realistic training exercises.

The decision-maker must analyze the various training advantages and shortcomings associated with the location of the engineer bridge company. Rankings must reflect those options which best accommodate all training outcomes.

Weight: Because both engineer and maneuver commanders will insure their units are trained to the best possible state of readiness, this criterion is assigned an importance weight of "1".

Decision: I will select the bridge structure option which insures adequate collective training of bridge crewmen

yet maintains a high state of maneuver brigade proficiency in the planning of river crossing operations.

6. MAINTENANCE - Discussion: The maintenance aspect of the decision involves the centralization of bridging assets and the availability of those assets in the forward support of actual bridging operations.

Location of the bridge company at corps, whether as a separate company or in a bridge battalion, would consolidate like equipment in a central unit providing certain economies of scale. Cross-leveling of both parts, equipment, and experience would be greatly enhanced.

On the other hand, the location of all maintenance assets outside the division level would create the absence of rapid repair capability in support of operations well forward of the division area. Additional corps level maintenance teams would have to accompany the bridge company in the corps task organization to provide this capability.

What might be gained in the centralization of assets might be lost in flexibility and responsiveness of maintenance capability. The decision-maker must analyze the impact of this trade-off and assign relative importance to the options which he feels would provide the best 'overall' support to river crossing operations.

Weight: While maintenance is an important area, solutions are available to any of the three options through adequate planning and organization. I have, therefore, assigned this criterion is a weight of "1".

Decision: I will pick the option which provides a responsive maintenance capability at the river crossing site during war yet offers adequate maintenance support in peace.

7. PLANNING CONSIDERATIONS - Discussion: FM 90-13, the new coordinating draft on river crossing doctrine, highlights the importance of detailed planning for river crossing operations. In general, the corps identifies the crossing requirement and provides assets, the division does detailed terrain analysis and rough crossing planning, and the brigade does detailed crossing planning.[13]

The technical and tactical aspects of the operation remain the same regardless of the actual location of the bridge company. This particular criterion analyzes two divergent aspects of planning which differ significantly depending on the option under consideration - predictability and frequency.

The predictability of a requirement in terms of time and location have a significant impact upon the force structuring decision. By its nature, a river crossing operation should be predictable. There are normally important data on file for water obstacles which are considered to be tactically significant. These data can be studied and trained-on in peacetime. The ability of engineer and maneuver staffs to predict and to plan river crossing operations, within the context of a fluid tactical situation, does clearly exist.

The ability to anticipate requirements and to execute pre-planned contingencies should clearly enhance the responsiveness of the river crossing support available from non-divisional engineer units at echelons above division.[14] As a result, requirements which are highly predictable lend themselves well to centralized planning and decentralized execution.

The frequency of river crossing operations offers some important insights as to the recommended location of bridging assets. As the frequency of a mission requirement increases, so does the need to decentralize the capability to satisfy the requirement down to the level at which the requirement exists.[13] Conversely, as frequency decreases, there is an increased capability of providing assets to a lower echelon when and only when they are needed. Based on historical river encounter rates, it is likely that the future requirement to cross wide, wet gaps will not be a highly frequent event.

In summary, the predictability and frequency of expected river crossing operations are critical to the location of bridging assets. Highly predictable, low frequency crossing operations support having the assets at corps; the inverse situation supports the idea of location at division. In judging options, the decision-maker must project what force structure best uses this planning insight to support crossing operations.

Weight: Because of the importance and relevance of predictability and frequency to the tactical situation, I have assigned this criterion a weight of "3".

Decision: Today's advanced intelligence capabilities and existing geographic data bases reinforce the ability to predict major water obstacles. I will select the option which takes best advantage of known obstacles of low frequency.

8. MANEUVERABILITY OF HEAVY BRIGADE - Discussion: The scope of this criterion involves both the strategic deployability and the tactical and operational maneuverability of the heavy division. It primarily addresses the impact which the engineer bridge company has on the movement of a heavy division when major river crossings **are not anticipated.**

The structuring of the engineer bridge company at corps level would undoubtedly enhance the deployability of maneuver divisions. At a strength of 128 soldiers and equipped with thirty-six bridge transporters, the bridge company adds rather significantly to the total force, weight, and cube of the division.[16] The removal of the bridge company from the division does not eliminate the airlift requirement however, it just shifts it to corps level. Additionally, as the historical studies of contingency operations in chapter 4 will point out, missions requiring rapid deployment of maneuver units to a theater with water obstacles often employ other crossing means. The

use of in-country bridging equipment, organic division aviation, or enhanced protection of existing bridges will eliminate this concern.

The maneuverability of the heavy division is adversely impacted by its organic bridge company. The significant amount of non-hardened bridge boats, ribbon bay sections, and bridge transporters makes it both a slow and lucrative target. Simply stated, the bridge company is quite a lot of baggage for the division to carry around the battlefield.[17] While at times the bridge company is a vital mobility enhancer, it often detracts from the same mobility that it is designed to enhance.

In evaluating options with regard to maneuverability, the decision-maker must weigh the impact bridge equipment has on the maneuver units' ability to move on the battlefield.

Weight: I have assigned a weighting of "1" to this criterion based on two considerations. First, few commanders strategically deploy a bridge company -other options are available to the tactical plan to overcome the logistical nightmare. Secondly, because a bridge company is organic to a division does not inherently mandate that it will negatively impact the units' mobility. Proper tactical movement procedures and prior planning can overcome most of the associated impacts.

Decision: Retaining the bridge company at division has no positive impact on a brigade's maneuverability when

river crossings are not anticipated. I will select the option which removes the company from the division.

SAMPLE DECISION MATRIX:

I have provided a sample decision matrix (weighted) to help the reader understand how the parts of the decision tool fit together.

I have incorporated the newly developed evaluation criteria into the rows with the associated assigned weights. A decision framework has now been established for later use in Chapter 7, Evaluation of Options.

ENGINEER BRIDGE OPTIONS \ CRITERIA	WEIGHT FACTOR	DIVISION BRIDGE CO RANK / TOTAL	SEP CO. IN CORPS BDE RANK / TOTAL	COMPANY IN CORPS BRIDGE BN RANK / TOTAL
1. RESPONSIVE SUPPORT:	4	/	/	/
2. OPTIMUM UTILIZATION:	2	/	/	/
3. COMMAND AND CONTROL:	3	/	/	/
4. BRIDGE VULNERABILITY:	1	/	/	/
5. TRAINING:	1	/	/	/
6. MAINTENANCE:	1	/	/	/
7. PLANNING CONSIDERATIONS:	3	/	/	/
8. MANEUVERABILITY OF HEAVY BRIGADE:	1	/	/	/
OPTION TOTALS:	16.00			

CONCLUSION:

The methodology I have outlined establishes a solid framework which insures a defendable solution to the problem. In the first chapter, I developed three possible resolutions to the future positioning of the bridge company. This chapter highlights the supporting question tier, defines applicable evaluation criteria, and outlines the decision-making tools I use later in the evaluation process. Chapters 4 through 6 provides a triangular dialogue of knowledge from which to determine adequate evaluation information and ranking framework. Chapter 7 is the heart of my thesis. I evaluate the historical, doctrinal (ALB-F and river crossing), and force structure perspectives critical to the success of river crossing operations. Each option is judged on its ability to meet the criteria resulting in the assignment of a relative rank. Numerical totals are calculated for an unweighted matrix and three different weighted matrices. My final recommendation, along with suggested modifications and changes to current procedures and doctrine, conclude the thesis in chapter 8.

CHAPTER THREE - ENDNOTES

[1]U.S. Army, Student Text 25-1, Resource Planning and Allocation (Fort Leavenworth, Kansas: U.S. Army Command and General Staff College, 1989), 3-1.

[2]Ibid.

[3]U.S. Army, Student Text E105, Quantitative Skills (Fort Leavenworth, Kansas: Combined Arms and Services Staff School, 1986), 57.

[4]Ibid, 71.

[5]Micheal K. Collmeyer, "Gap Crossing Operations and the E-Force Concept," (USAWC Military Studies Program Paper, U.S. Army War College, 1988), 21.

[6]Ibid.

[7]Ibid, 15.

[8]BDM Corporation, Survey of Bridging Requirements for the Light Division Final Report (McClean, Virginia: BDM Corporation, 1982), A-1 to A-3.

[9]U.S. Army, FM 90-13 (Coordinating Draft), Combined Arms River Crossing Operations (Fort Leonard Wood, Missouri: U.S. Army Engineer School, 1990), 5-1.

[10]Collmeyer, 27.

[11]Ibid, 25.

[12]Ibid, 30.

[13]FM 90-13, 6-1.

[14]Collmeyer, 11.

[15]Ibid, 12.

[16]Ibid, 23.

[17]Ibid, 24.

CHAPTER FOUR

HISTORICAL ANALYSIS

> Suppose the bridge is out, the opposite bank held by the enemy. Time was when the Army waited till night, crossed in the dark by raft of skiff, gained a foothold on the opposite bank, and later built a bridge. Now it appears that success may sometimes be achieved more speedily, - a crossing accomplished audaciously in fast motorboats, or a bridge built under fire.[1]
>
> COL Godfrey, July 1940

OVERVIEW:

Too many times throughout history the Army has failed to learn from past mistakes. New technology and a changing threat have often called for new doctrine. As a result, force structure developers have surged ahead. Many times th's was done without devoting full attention to past conflicts. Although the optimum location of the divisional bridge company is laced with variables dependent of future outcomes, a close review of historical evidence is warranted. History cannot provide an accurate assessment of future conflicts involving future AirLand Battle doctrine, high technology weapons, and unproven engineer forces. It can provide, however, a broad perspective of previous

operations in which engineer units used basic river crossing fundamentals to effectively support maneuver forces.

Ever since armies have marched and fought, leaders have faced the problem of crossing gaps. The advantages of using rivers as natural obstacles usually involved their incorporation into tactical defensive plans. FM 5-101, the Army's mobility manual, states that since World War II, twenty-nine significant battles have been fought at gap-crossing sites. Twenty-one of those battles occurred at rivers wider than 150 meters, with the attacker being successful in all 21 operations.

In this chapter, I examine the six major conflicts since the development of tactical bridging. World War II provides the largest factual database of bridging operations. This high-intensity conflict involves a wide range of operations conducted by engineer organizations different from those of today. The Korean and Vietnam wars reflect a mid-intensity conflict with divergent bridging experiences. Grenada and Panama complete the spectrum of conflict by providing insight into low intensity operations conducted without divisional bridging assets. Operation Desert Storm offers a review of the Army's latest doctrine and units in modern conflict. The lessons learned are not meant to form a basis of factual evidence. They form a broad perspective of wartime experiences and operations which can be drawn on when analyzing the optimum positioning of the bridge company.

WORLD WAR II:

Like the Army of the 1990's, the Army of the early 1940's struggled with the problems of changing from a doctrine based on attrition to a doctrine based on maneuver. A review of the development of bridging doctrine and organizations during the early years of World War II provides a historical perspective into the current situation and its doctrinal challenges. The same doctrinal arguments of bridging capabilities and impact on maneuver divisions prevalent 50 years ago still apply today.

History of U.S. Army Bridging Units: The United States Army of the twenties and thirties was largely a product of the first World War. The square infantry division consisting of foot soldiers, horses, and motor vehicles was the basic maneuver unit.[2] The large size of the division, with a fixed strength of 22,000 men, created difficulties maneuvering the unit. The army of the thirties was too small to form units bigger than divisions and established corps only in an emergency.

Engineer functions during World War I were primarily limited to mobility tasks with 75 percent of their effort dedicated to maintenance and repair of muddy lines of communication roadways.[3] Survivability tasks included preparations of defensive positions, construction of support buildings, and defensive obstacle systems. Pontoon bridge companies were small in number, limited in capability, and inconsistently assigned to engineer regiments.

The assignment of General Malin Craig as Army Chief of Staff in 1935 accelerated the development of bridging doctrine and equipment development. He ordered an examination of the organization and tactics of the Army with an aim to increase its mobility. The technological advances in mechanical power begged maximum use of motorized vehicles with a corresponding reduction in the size of troop units. The period between the wars had been marked by great improvements in tanks, vehicles, and airplanes, making the adoption of new tactics imperative.[4] Advances in weapons capabilities allowed for cuts in personnel without a loss of firepower. Craig pushed for leaner infantry divisions of 13,552 men, shifting support and contingency mission to corps level.

The Corps of Engineers reassured the importance of bridging in providing mobility to the new Army. Several key officers in the Corps noted an inadequacy in the ability of existing U.S. bridging to support the mission. Concerns were also raised about the ease at which pontoon bridges could be systematically destroyed, seriously impacting the success of division offensive operations.

A massive research and development effort was initiated in 1938 to upgrade the bridging inventory allowing increased capacity and diversification. Working in conjunction with the General Staff, infantry and armor experts, three general types of bridges were designed and tested - assault, general support, and a line of

communication bridge. By the fall of 1940, the engineer branch perfected a pneumatic-float treadway bridge with a 30-ton capacity. Engineer troops could assemble the 315 meters of bridge in 2 1/2 hours.[5] When reinforced, this bridge was capable of supporting the crossing of the new 33 ton Sheridan tank.

Research committees at the engineer school were matching bridging requirements and capabilities with existing engineer organizations. They recommended the assignment of bridge building to pontoon units and corps combat engineers. Heavy pontoon bridges were built by heavy pontoon battalions with the labor assistance from general support units. The divisional engineer company supported the assault crossings.

Problems involving the adequacy and necessity of bridging at the division level plagued the engineer doctrine writers in 1941. The engineer armored battalion, with its bridge company, represented an exception to the general doctrine. The research committee conclude that:

> the divisional bridge company did not have sufficient equipment for a major operation, it deprived the battalion of working personnel for other missions, and that it added to the battalion's road space, and that there was considerable terrain where it would not be needed.[6]

The inability to use equipment during certain tactical situations, the lack of operational supportability, and logistical restrictions were additional distractors. The committee recommended elimination of the divisional bridge company and replacement of it with a lettered

company. Engineer officers supporting the need for the divisional bridging capability argued that the company was built around equipment that was not in existence and served as a goal for focusing advanced development.

The Engineer School Commandant endorsed the elimination of the bridge company. This raised objections by armored force personnel who argued that although additional combat engineers were needed, they would not come as a result of losing the bridging capability. Armor proponents argued that the significance of this issue had also been recognized by foreign armies who saw a critical need for bridging in close support of armor. The Commanding General of the Armored Force decided the issue. He stated that until a heavy pontoon bridge company with 500 feet of portable bridge was fielded to each armored division, the existing bridge company would remain in all divisions.

Reorganization for Global War: In August 1942, the War Department directed Army Ground Forces (AGF) to determine the number and types of service units required for direct support of ground combat units. Common engineer units were often assigned to three companies: The AGF, the Army Air Forces (AAF), and the combat service support component - the Army Services Forces (ASF). Command and control was confused as units from one command often completed missions in another command's area of responsibility. In December, 1942 the War Department provided broad definitions to all technical services for

organizational commonality. Engineer combat battalions, along with pontoon and treadway companies, were classified as combat troops under control of the Army Ground Forces. The bridge companies remained in the division conducting operations in the combat zone while corps units supported missions in the communication zone.

The War Department's guidelines created units which could not be resourced and manned causing further reorganization of tactical units. Shortages of rubber for tires and transport ships for deployment led to vehicle reductions of 20 percent and manpower reductions of 15 percent.[7] This generated a need for lighter, easier to transport units and resulted in reductions in the engineer force structure. In addition to resource constraints, the War Department stressed the need for a flexible army that could fight a war under diverse conditions anywhere in the world.

Spearheading the reorganization of the AGF was its Commanding General, LTG Lesley J. McNair. He believed that the most effective use of manpower was strength in fighting units, not service units. As a result, the infantry divisional engineer battalion was reduced from 745 to 647 men. Significant numbers of trucks, antitank weapons, infantry support rafts, and bridges were eliminated. These were the same elements which had been added in 1942. The infantry division remained unchanged throughout the duration of the war.

The armored division was more closely scrutinized by McNair resulting in a 55 percent decrease in tank personnel and 20 percent increase in infantry. The radical push for a larger infantry force resulted from the early successes of antitank guns and mines used against American armor by Rommel's Africa Corps in North Africa. The absence of major water obstacles in the North African campaign probably resulted in bridge capability being viewed as more of a nuisance than an asset.

This readjustment caused corresponding force changes in the engineer force structure. McNair personally insisted that the heavy division engineer battalion be cut more than 40 percent, making the battalion roughly the same size as the infantry division engineer battalion. He stated it was inconsistent to argue on one hand that tracked vehicles could move easily cross-country and on the other hand demand a large engineer force to ensure mobility.[8] Armor proponents had highlighted the enhanced mobility of tanks to such an extent that a reduction in engineer capability was inevitable.

Divisional Bridge Company eliminated: One of the major forces pushing for the elimination of a divisional bridge company turned out to be the new assistant chief of engineers, BG Clarence L. Sturdevant. Concerned with the adequacy of the combat engineer battalion of the heavy division, Sturdevant lead a study into various force

structure alternatives allowing for an enhanced combat support capability.

The study concluded that the engineer battalion was too small and should expand to four companies of three platoons each. The size of such a battalion, including the bridge company, would have constituted 5.5 percent of a heavy division. They considered that statistic, however, would not gain approval with Army Ground Forces. The Armored Force Engineer, MG Lunsford Oliver, concurred with the increased force but felt the battalion would be too large to adequately control. His solution involved eliminating the organic bridge company and attaching such companies to armored divisions as needed.

It is important to expand on this action of MG Oliver to highlight the relevance of his comments. Many of Oliver's thoughts and concerns equally apply to today's current dilemma of proper positioning of bridging assets. Oliver's insights provide a doctrinal mindset which I will further expand in Chapter 5.

Oliver stated that the inclusion of the organic bridge company in the battalion was a step in the right direction. It recognized the need for armored engineers to have bridge equipment with them. Rather than be in the rear of the formation, unable to respond quickly, Oliver stressed the importance of responsive bridge support. More importantly, however, was the optimum availability of sufficient organic combat engineers while still insuring

adequate bridging capability. The location of bridge assets at corps, attached to maneuver units early in the operation, solved both concerns.

Oliver stated that, in combat, divisional bridge assets might fall short from the required amount if equipment could only be drawn from one company. The number of bridge companies attached should be dependent on the tactical situation. Flexibility was the characteristic most desired. "With the elimination of the bridge company, the engineer armored battalion could absorb another lettered company and all four companies could he composed of three rather than four platoons."[3] He advocated attaching a bridge company to each armored division during training to insure bridge familiarization and crossing proficiency. Although the argument had more pertinence for armored than infantry engineers, the ultimate solution applied to both divisions and Oliver's recommendations were approved.

In September, 1943 a new Table of Organization (TOE) was released without a divisional bridging capability. The treadway bridge company was made a non-divisional unit supporting all combat, combat-support, and combat service support roles.

Due to the great flexibility, enhanced mobility, and increased capability of the treadway bridge, it was in constant use. Other pontoon bridges, older and harder to construct, remained underused. The armored battalion remained relatively unchanged throughout the remainder of

the war with three line companies and a headquarters element totalling 693 officers and men.

Engineer Groups and Brigades: McNair continued his reorganization of the Army at echelons above division. He reversed the strongly held thought of standardized corps and armies developed in the 1930's. The use of task forces of various strengths in all types of terrain demanded a flexible organization which could not be provided by Type Army Corps and Type Armies.

The Engineer Branch strongly endorsed the Army Group Force's concept of organizing corps and army combat engineers on the basis of groups rather than regiments. A group would consist of two to six combat battalions commanded by a colonel. The War Department approved this plan in January 1943 and groups were formed consisting of three combat battalions, an equipment company, and the heavy pontoon bridge.

Although the bridging battalion allowed for an improved command and control structure, the new alignment brought continued scrutiny under the Army Ground Force Reduction Board. In an effort to 'reduce the fat' from engineer units, the battalion lost the light equipment platoon of 132 men. The board's remarks continued to reflect a desire for maneuverability when it released a statement that the bridging battalion should not be a roving depot but a tactical unit able to construct a heavy bridge.

The result was a bridge battalion of 369 enlisted men which remained relatively unchanged during the war.

Actual Operations: The scope, duration, physical terrain of a high intensity conflict like World War II called for all operations done on a large scale. This resulted in campaigns requiring river crossings planned by echelons above division. Armies and corps assigned missions and provided the necessary support forces and equipment. Divisions controlled the movement across the river but were always part of a larger crossing force. Brigades were assault forces who executed the crossings to secure the bridgehead. As a result, history provided numerous well documented operations in which organic bridging assets were not in the division. I use the famous Rhine river crossings in my analysis as being representative of river crossing operations in the European theater.

Bridging the Rhine: The Rhine River was the largest and most challenging natural obstacle facing the engineers in Europe. The width of the 320 mile-long river, from Basle to the Netherlands, varied from 700 to 2000 feet.[10] The Allied force crossing in 1945 was perhaps the largest river crossing operation conducted in history. It involved the most extensive use of bridges and maneuver units with unlimited command and control challenges.

After the success of the Normandy and Anzio landings, the Allies never doubted they would defeat and occupy Germany. The preparations for crossing the Rhine began in

England as early as August 1944, signifying the extent of time available for detail planning. Engineer units conducted extensive training programs behind the lines. Dossiers were compiled on specific bridge sites and preliminary estimates were made of tactical crossing equipment.

This planning continued throughout the winter of 1944-1945 and more river intelligence was gathered. Once everything was ready, the 12th U.S. Army Group with its First, Third, and Ninth U.S. Armies and the 6th U.S. Army Group's Seventh Army began crossing operations. Although Patton's Third Army most efficiently integrated corps bridging assets to accomplish the mission, it is important to understand the relationships and successes of the other armies as well.

First Army: First Army constructed numerous bridges in support of III, VII, and V Corps. All river crossings were corps or larger size operations. They employed divisional engineers in the assault phase supplemented by combat engineer and bridge companies in the bridging phase.

Examples of this relationship include 9th Armored Division's early capture of the bridge at Remagen. To provide additional crossing capability to the already damaged Remagen bridge, the 1111th Engineer Group was tasked to erect a 1032 foot Class 40 steel treadway bridge. The group's 291st Combat Engineer Battalion constructed the bridge using equipment from the two corps treadway bridge

companies. Construction was completed in 33 hours with minimal delay to the forward advance of the division's maneuver brigades. Similar operations were conducted in the other corps with a total of five treadway bridges, three heavy pontoon ferries, and a heavy pontoon bridge completed by corps bridge units.

Ninth and Seventh armies conducted similar bridging operations using assets from engineer combat battalions and corps treadway bridge companies. Engineers provided responsive support by constructing fourteen floating bridges. Overall, a total of five separate corps completed the crossing in ten days.

Third Army: The Third Army plan required numerous crossings near Mainz with Frankfurt and Darmstadt as follow on targets. Patton served as the Third Army commander and had gained much experience in past river crossing operations across France, Belgium, and Germany. Bradley, commander of the 12th Army Group, stressed to Patton the need for speed in conducting a hasty attack. He directed Patton to move his assault bridging stocks forward because, "I want you to take the Rhine on the run. We're not going to stop, give the other fellow a chance to build up and raise hell when we come across."[11] This was all Patton needed to hear.

The Third Army plan traded optimum crossing sites in the north in order to achieve surprise in the south. Although the plan called for a hasty crossing, it was well planned and resourced with over 7500 corps engineers. Toul,

France, became the assembly point for stocking of bridging equipment and trucks for transportation.

> Patton, who in Sicily had brushed off supply as a bothersome detail, demonstrated how well he had learned his lesson by stuffing his Third Army dumps with engineer bridging equipment to be used in spanning the Rhine.... months later that foresight paid off when George took the Rhine on the run and jumped Third Army across it on those beautiful engineer stores.[12]

XII U.S. Corps conducted the main effort near Nierstein. The 1135th Engineer Combat Group directed the operation commencing at 2200 on 22 March, 1945. Elements of the 11th Infantry were paddled across by the 204th Engineer Combat Battalion. During the night, engineers began work on class 40 treadway bridges with vehicles crossing to expand the bridgehead by late afternoon. Heavy pontoon companies from corps constructed and operated class 40 rafts and bridges throughout the crossing area.

Five divisions passed over the three bridges by March 27 with supplies and necessary supporting troops. 60,000 vehicles crossed the Rhine in the 10 days from 21 March to 31 March. XII and XX Corps operations were equally demanding but proved to employ the same degree of extensive planning and engineer responsiveness.

WWII Conclusions: One reason for the phenomenal success of the Third Army's operation was the overwhelming engineer planning and support. This level of operational foresight and calculation was prevalent not only in Third Army but throughout the Rhine river crossing area. Although engineer units were not necessarily organic or habitually

supporting forces, Patton did employ a well-tailored organization to ensure mission success.[13] The availability of adequate time to coordinate crossing sites, engineer units, bridging assets, traffic control measures, and close synchronization with maneuver units allowed for maximum efficiency. The lack of organic bridging assets in the division or habitually associated corps units did not prevent the conduct of responsive support to crossing maneuvers.

To summarize the events of the Rhine river crossing, the 5th Division official history best portrays the feeling of a successful major deliberate river crossing operation.

> It was because the buildup of the bridgehead was so fast and smooth that the crossing eventually proved so successful. The engineers set all sorts of records for speed in building Class 40 rafts and two bridges, a heavy pontoon and a treadway....By this time the Rhine bridgehead had taken on the appearance of Normandy transplanted into Germany.... transporting supplies and ammunition to assault troops pushing inland.[14]

A key point I will examine later in the paper is the advantage Patton had in not having the bridging assets organic to the maneuver divisions. With bridging centralized at corps level, armies crossing the Rhine were able to decentralize combat engineer assets to the maneuver brigades while centralizing specialized bridge companies at corps. This force structure gave commanders more flexibility to shape their operational plan maximizing force agility at the critical time and place.

KOREAN WAR:

Organization and Doctrine: The Korean War, like World War II, required extensive mobility, countermobility, and survivability support using limited engineer units and resources. The war involved all phases of engineer operations - supporting the infantry, artillery, and armor in defensive and offensive combat. Engineers built and destroyed roads, railroads, bridges and airstrips, supported minelaying and anti-mine operations, and participated in combat as infantry when required.[15]

While river crossing doctrine remained unchanged, organization of bridging assets underwent significant revisions. A revised post World War II Table of Organization and Allowances (TO&E) published on 22 April 1948 listed selected M2 widened steel treadway bridge companies at division level.[16] Although there is no documentation available on the background rational for this move, at the beginning of the Korean War every Armored Engineer Combat Battalion in an armored division had a float bridging capability. Apparently proponents who had argued against the AGF removal of the company in 1942 eventually won their case.

While the Armored Division regained the bridging assets, many of the critical river crossings in the Korean War involvei the Infantry Division. These units were not as fortunate and, as in World War II, continued to receive their river crossing support from corps level treadway

bridge companies. The M2 Class 40 treadway bridge developed for World War II was still the workhorse, having proved itself time and again in Europe.

Actual Operations: The majority of bridging operations in the Korean War involved line of communication bridge repair and replacement. Hundreds of existing bridges, often blown by U.S. forces, were reinforced during offensive operations allowing rapid movement of supplies and troops to the front line. Corps bridge companies were often called to install expedient bridging along main supply routes until combat heavy battalions could replace it with permanent bridging.

Tactical bridging support mirrored many of the same successes and accomplishments found in WWII. The tactical situation and terrain called for an abundance of infantry divisions with few if any documented river crossings by armored divisions. As a result, the thrust of my analysis in the Korean theater involves the support of corps treadway bridge companies to advancing infantry divisions.

Due to the scope of most major offensives, river crossing operations were planned and resourced at corps level. Combat engineer battalions and treadway bridge companies were task-organized in advance of any operation to maneuver divisions for use during the crossing. The availability of time, combined with the centralization of tactical bridging assets at corps level, allowed greater flexibility to the corps plan. River crossings were on a

smaller scale with fewer rivers per axis of advance and less crossing areas per river. While not as extensive as the European theater, the majority of crossing operations achieved the same degree of success.

In light of numerous successful operations, I have analyzed one of the most famous yet unsynchronized operations of the campaign. The crossing of the Kumho/ Naktong rivers in September, 1950 demonstrates the inability of corps bridging assets to provide responsive bridging support to the maneuver division. It is a blatant example of how the lack of responsive bridging for maneuver units can result in friendly casualties.

Crossing Overview: Three months after the United States committed to the war effort in Korea, General Douglas MacArthur landed the 10th U.S. Corps at Inchon. This was one hundred miles to the rear of the forward enemy elements which were hammering away at the 8th Army in the Pusan perimeter. On 16 September, 1950 the 8th Army launched an offensive to break out of the defensive perimeter. While the 1st Cavalry Division and the 5th Regimental Combat Team held the shoulders, the 24th Division was committed across the river, under the cover of darkness, to continue the offensive.

Engineer units and equipment were both in short supply. Supporting the 24th Division directly were the 11th Combat Engineer Battalion (Corps) and the 55th Treadway Bridge

Company. The bridge company possessed 80% of the available bridging in theater with 864 feet of M2 treadway bridge on hand.[17]

In addition to a severe shortage of float bridging, the necessary erection equipment also remained in critically short supply. There were no serviceable power boats and substitute outboard motors to position the rafts were practically nonexistent. With these meager means, the engineer planners at 1st Corps, 24th Division, and units supporting the crossing devised a workable plan to launch the 24th Division across the Naktong River.

The plan involved crossing the river after dark on the night of 18-19 September and attacking along the west bank of the Naktong toward Waegwam. The most important task involved the construction of a widened steel treadway float bridge across the Naktong to provide the division's heavy loads access to the west shore. On the morning of 18 September, when the 24th Division started its move from its assembly area, a normally easily fordable stream was to wreck havoc with the crossing operation.[18]

Kumho River: Engineer planners had concentrated their attention on the Naktong River but failed to consider a significant tributary, the Kumho River. During dry weather, the Kumho posed no great threat for movement since the road forded the river in a few shallow locations. An 'underwater bridge' was located on the site constructed of sandbags, gravel, and gasoline drum culverts. Ninety-eight

percent the river's flow went over the top of the gravel roadway as the culverts were usually crushed by oversized vehicles.[19] All vehicles except jeeps could normally cross the 30 inch deep ford with limited rafting capability available for jeeps and special equipment.

Heavy rains had inundated the crossing location a week before the offensive and fording was slow and dangerous. When the 24th Division arrived, traffic was reduced to only one lane over the top of a narrow sand and gravel weir. Water was five feet deep on the upstream side of the roadway requiring constant maintenance and upgrade. Additional vehicle types had to be rafted across the Kumho due to increased water depth on the roadway.

It soon became evident that the ford would not support the advance of the 24th to the Naktong. The resulting delay would affect the ability of the division to conduct a night crossing. Despite extensive engineer efforts to improve the crossing, traffic had become hopelessly delayed.

> As far as the eye could see from the Kumho River down the one and one-half lane road to Taegu, trucks and jeeps of the advancing 24th Division and supporting units sat bumper to bumper in one long, immobile column. By dark, the column of vehicles waiting to cross the Kumho River stretched for five miles.[20]

By late afternoon, the 1st Corps Engineer, Colonel Emerson C. Itschner, made the decision to commit part of the 55th bridge company's limited treadway bridge intended for the Naktong. The contingency plan called for constructing a

makeshift trestle bridge across the Kumho until the 24th was across, then re-position the needed sections to the Naktong crossing site.

Had the bridge company been organic to the division and located far forward in the march column, I believe the crossing would have gone smoother. As a corps follow-on unit, however, it was miles back in march column. Although this might have been a safe place to position the bridge enroute to the Naktong, the positioning did not allow enough flexibility to handle mobility problems enroute. As a result, the bridge assets did not arrive until 1050 hours in the morning of the 19th, 18 hours after Itschner's decision to employ it.

Impact of Naktong Crossing: Critical to the success of the Naktong crossing was the conduct of the initial assault done under the cover of darkness. The 24th Division's organic battalion, the 3rd Engineers, were in the front of the march with the necessary assault boats, troops and equipment needed to reach the Naktong's far bank. As midnight approached, the division commander feared that daylight might arrive before the crossing started, with the troops consequently exposed to heavy casualties. While the bridge was being constructed, assault forces finally crossed the Kumho using the limited capacity of the ford and existing rafts.

As the 276-foot Kumho bridge took over 9 hours to complete, the first significant traffic flow of the 24th

Division commenced at 2020 hours.[21] This delayed the division's movement to reinforce supporting assault forces securing the Naktong's near bank and supporting flanks.

The decision to alleviate the Kumho River traffic 'bottleneck' necessitated Colonel's Itschner's gambling with the corps' resources of float bridging. The 864 feet of treadway bridge available was obviously insufficient to cross the 276 foot Kumho and the 700 foot Naktong. In view of the inadequate amount of bridging, the Naktong should have received first priority in planning and allocation. Although the effort to solve the problem was commendable, the lead maneuver elements of the Naktong crossing were sitting in line at the Kumho when they should have been assaulting across the Naktong.

The assault commander first postponed the attack from 2200 on the 18 September to 0355, then finally to 0500 on the morning of 19 September.[22] Although there was no indication of enemy on the opposite bank, the 24th Division Commander still wanted to cross before dawn. He urged his commanders to get the maximum number of men across the river before daylight in order to minimize their vulnerability to small arms fire.

At 0530 twenty eight assault boats started to the west side of the quiet Naktong. Without warning, the enemy trapped the troops in a crossfire of small arms, machine gun, and mortar fire. At the same time, artillery shells began falling on both banks. For a time, it was doubtful

the crossing would succeed. Because of the murderous fire on the crossing site, eight of the original twenty eight assault boats in the initial wave failed to return to the near shore.[23] A significant delay in the crossing of adequate infantry support prohibited the rapid establishment of the bridgehead.

Using numerous air force sorties with supporting napalm and strafing fires, assault forces continued the advance throughout the entire day. Forces secured the bridgehead and reconsolidated follow-on division forces by nightfall.

Although the 24th Division secured the west bank on the morning of 20 September, it had not achieved its success during the preceding day without its share of casualties. Enemy fire caused one hundred-seventy infantry and sixty-one engineer soldier casualties during the crossing.[24]

The Kumho floating bridge was replaced by timber trestle sections with the required treadway shifted to the Naktong site. After 36 hours of work, a 700 foot treadway bridge was completed at 1000 hours on 22 September.[25] Division transport, artillery, tanks, and service units began crossing immediately with most of the division across by midnight.

Conclusion: Historical accounts of this significant river crossing blunder state that:

> except for the muddle in bridging the Kumho river resulting in a delayed crossing of the Naktong...,the five day operation of the 24th Division left little to be desired.[26]

Engineers can gain several important lessons from this operation. The Naktong crossing demonstrates the importance of proper reconnaissance, consideration of tributaries, fluctuations of water levels, and proper ma .gement planning. Leaving those points to the river crossing analysts, some conclusions can easily be drawn about the location and structuring of bridging assets at corps level.

The Kumho river crossing failure and the resultant delay to the division's crossing were primarily due to a lack of prior planning. Lessons learned from World War II pointed out that, given accurate river and enemy information and adequate planning time, float bridge assets can be consolidated at corps level, providing flexibility and concentration. In the absence of time and information, divisions do not have the organic assets to continue the offensive across a major water obstacle.

The 24th Division faced a relatively common occurrence in their Naktong crossing: the unplanned, unresourced river crossing. The only bridging assets able to project their combat power into the enemy were located miles back in the march column. The movement of those assets forward, combined with the construction of an unplanned bridge, significantly delayed the nighttime crossing. Lives were lost and the objective taken late.

Had the treadway bridge company, or in present terms the ribbon bridge, had been organic to the infantry

division, this needless loss of life might not have occurred. The constant increase of motorized equipment in the infantry division caused it to have the same requirement for float bridging as the armored division.

The command and control of those bridging assets would have been under the same commander who directed the assault boat crossings. He would have ensured that contingencies were considered, branches and sequels developed, and location of bridging optimized. Rather than requiring the corps engineer to personally make a decision, the battalion commander would have had the available assets to rectify the problem.

In the modern days of AirLand Battle, the tenets of initiative, agility, depth, and synchronization are key to the success of any operation. Many tactical commanders and staff would argue that synchronization is clearly the most important tenet. The inability of 1st Corps to predict the Kumho crossing is unforgivable, but in war, the unknown is often the norm. The structuring of float bridge companies at corps level did not provide the flexibility needed to adapt to the situation. One inescapable fact remains: engineer support had failed at a crucial time which undoubtedly cost infantry lives the following morning.[27]

VIETNAM WAR:

Organization and Doctrine: Significant changes occurred in both engineer bridge company structuring and equipment upgrade in the inter-war period. In 1956, the M4T6 dry/wet span float bridge was fielded to the existing treadway bridge company offering a lighter, stronger, and more extensive capability. The procurement of numerous Bailey bridge sets satisfied the "Line of Communication" bridge requirement replacing the old heavy pontoon sets found in corps bridge companies.

In the mid-1950's, a French engineer officer developed a mobile amphibious bridge. In November 1960, the Engineer Research and Development Laboratories at Fort Belvoir, Virginia, completed a study for an American version of the mobile assault bridge-ferry (MAB). A new Army directive stated that the bridge would be used within the combat zone for multiple river crossings.[28] It would permit high-volume stream crossing of armor and supporting heavy tactical loads. The directive highlighted that while assault ferries might work for small-scale operations, multiple heavy assault bridging was essential for sizable crossings. Combat forces had to be massed and crossed in minimum time to retain the initiative.

The subsequent development and fielding of the M4T6 and later the MAB provided a substantial crossing capability with reduced logistical and deployment problems. This led to the development of the engineer bridge company in the

infantry division. TO&E No. 5-148E, dated 15 July 1963 documents the infantry division bridge company and delineates that it be equipped with either MAB or M4T6 sets.[29] For the first time since 1942, organic bridge companies were again located in the armored and infantry division engineer battalion.

Overview of Vietnam Operations: The restoration and construction of bridges in Vietnam concentrated on lines of communication support rather than tactical mobility to the heavy maneuver unit. To link all the stretches of paved highway, construction plans called for building approximately 250 new bridges - both floating and dry span.[30] Totalling 11,300 meters, these new bridges supplemented existing spans giving the republic a network of uninterrupted highways.[31] The system of roads stretched from the Mekong Delta to the demilitarized zone and from seacoast to seacoast.

The Vietnam War differed in both terrain and type of conflict from World War II and the Korean War. As a result, I expected major changes in engineer support and organizations. Although army corps were basically replaced by Field Forces, the amount and type of corps units were consistent with earlier conflicts. The only major difference was in the level of command and control within the field force.

Non-Divisional Command and Control: The massive effort required in combat support and base development made

engineer officers resist the transfer of any of their units to the tactical headquarters of field forces. Operational control of all non-divisional engineers remained with the Engineer Command, a brigadier general billet under direct control of the deputy commander of U.S. Army, Vietnam.

The method which had evolved for providing engineer support to a corps or field force equivalent did not conform to previous U.S. Army doctrine. Habitually, one engineer group supported a corps and was commanded by the corps engineer. In South Vietnam, the field force (corps) engineer had only a small planning section with no permanently assigned troop units. Engineer units provided support in the same manner as Army artillery units placed in general support. The two concepts differ in that a corps engineer normally orders subordinate units to carry out prescribed missions. When corresponding units are placed in general support, the corps engineer requests them to carry out missions. However, each supporting unit commander may disapprove the request in whole or part.[32]

This relationship created the possibility that a force field engineer not have the authority to direct the supporting engineer units. Group commanders under control of the Engineer Command assigned and supervised mobility, countermobility, survivability, and general engineering missions. The majority of historical documents I reviewed on this conflict, including the official Army monograph, stated that in spite of repeated urging to identify

deficiencies in the support relationship, **no field force commander** admitted to any lack of engineer support in any operation. In fact, all commanders expressed only praise for the timeliness and efficiency of that support.[33]

Bridging Support: It is critical to interpret this relationship in the context of the optimum positioning of the engineer bridge company. Although bridging operations were not as numerous or extensive as those in World War II and Korea, the fact remains that tactical force field commanders were satisfied with the degree of bridging support. The mix of divisional bridge companies supported in major operations by separate corps bridge companies provided adequate capability. Corps bridge units were able to quickly deploy necessary assets to the bridge site and perform the crossing operation in a manner responsive to the maneuver unit's overall mission.

The role of the divisional engineer battalion and its bridge company in the Vietnam theater is critical to the historical analysis. Division and brigade engineers took support away from the combat forces to accomplish what should have been non-divisional/corps projects.[34] Tasking them with base development missions created the possibility of a failure to provide optimum support to combat operations.

In the research of Vietnam historical reports, I found no examples in which a division conducted a major tactical river crossing supported by its own organic bridge

company. While these assets and personnel were available, the tactical situation diverted their priorities to Line of Communication (LOC) bridging. All case histories studied reflect that adequate time existed to plan and resource bridging operations. This factor was the most important element in allowing corps bridge units to provide reponsive support.

During my research I investigated numerous examples representative of the type and criticality of required bridging support. The majority of all bridging operations were divided between rear area sustainment support and tactical bridging in support of major field force mobility missions. Given the limited information on independent division operations, it is important to explore the employment of the corps bridge company and its support to the overall war effort.

General Engineering Support: The construction of a major depot and supply center on the peninsula of Cam Ranh Bay was one key example of float bridging support of sustainment operations. The configuration of the long peninsula required all construction and sustainment shipments to drive excessive distances to reach main supply routes on the mainland. The Transportation Corps operated a ferry from the mainland across the bay to the cantonment area on the peninsula which vastly reduced the overland distance.

Elements of the 553rd Engineer Bridge Company (Float Bridge) arrived on 6 October 1965 and constructed a 6-float M4T6 pontoon raft. The rafting operation soon proved unable of cope with the ever increasing traffic. Therefore, a 'fast raft' of greater capability and increased speed was created.

By the end of 1966, traffic between the peninsula and the mainland reached a point where the 553rd's operation proved inadequate. Using their initiative and engineering flexibility, the Group headquarters designed and installed bridging to handle the required flow. Forces comprised of the 39th Engineer Battalion (Combat), the 553rd Engineer Company, and a Vietnamese Army Float Bridge Company constructed a 1,115 foot float bridge. The pre-assembly of rafts was completed on 6 and 7 January 1966 and the bridge completed in sixteen hours on 8 January.[35] The Field Force commander personally commended the bridge units for their timely support to the maneuver forces. The ingenuity and resourcefulness of this operation greatly aided the completion of the Cam Ranh Bay facility.

Tactical Mobility Engineering: Operations occurring in the Vietnam Theater of Operations requiring immediate tactical bridging were rather limited and poorly documented. Most missions were either in support of forward movement of maneuver brigades or rapid repair of main supply routes to front line units. The responsiveness, dedication, and mission risk demonstrated by non-divisional bridge engineers

in support of divisional operations were exceptional. These units demonstrated that in this campaign, tactical bridging at the divisional level, combined with supplemental bridging at corps, enhanced the ability of maneuver divisions to accomplish their mission.

A critical Route 4 bridge emplacement provides an example of the expertise and proficiency gained by corps bridge units. Route 4 was the main supply road from the Mekong Delta to Saigon and its bridges were natural North Vietnamese targets. On 19 February 1968 Viet Cong forces destroyed a bridge in the III Corps sector spanning the Song Lu river.[36]

At 0730 a reconnaissance team from the 9th Infantry Division's organic engineer battalion discovered the damage. By 0830 the team filed the report with division headquarters which notified the II Field Force engineer section. The II Field Force engineer notified 20th Engineer Brigade. Because of the strategic and economic importance of the bridge, the 20th Engineer Brigade called for an immediate reaction mission.

The 34th Engineer Group, as opposed to the 9th divisional engineers, had the area of responsibility and passed the mission to the 617th Engineer Company.

After linking up with a prearranged security force, the 617th moved to the site. Craters on the bridge entrances were filled with sand carried by engineer dump trucks. Only 106 hours after the damage was reported, the float

bridge was emplaced and ready for action. Major General Robert R. Ploger, Army Engineer, stated in after action reports that:

> such action typified the efficiency of the Army engineer organization in South Vietnam. Whenever and wherever a bridge was destroyed, the engineers made sure that it was repaired or replaced in the shortest possible time.[37]

In addition to the physical repair of the bridge, it is critical to highlight the ease and efficiency of the command and control structure. A divisional unit was able to call to Field Force (corps) level requesting support and immediately receive soldiers on the ground beginning the mission.

The Cambodian Incursion in May and June 1970 provides additional examples of significant bridging operations. For years North Vietnamese regulars and Viet Cong had enjoyed the immunity of retreat into sanctuaries established in Cambodia. To aid the Vietnamization process by depriving the enemy of these sanctuaries, U.S. and South Vietnamese forces attacked the strongholds. Army engineers led the way.

The 20th Engineer Brigade was assigned to support the operation using assets from divisional battalions and corps units. Priority was first given to routes of advance and forward tactical airfields, then logistical bases and support routes. The accomplishments of the tactical units under pressure were impressive. Bridge engineers constructed twenty-three bridges throughout the area of operations.

The location of four engineer float bridge companies at corps level facilitated the building of a new support relationship. Corps CH-47's and Flying Cranes were able to quickly transport pre-assembled sections of M4T6 ramp and trestle sections to the divisional bridge sites.

Seven engineers were killed and 132 wounded during the engineer support operations in this campaign. Once again, the engineer soldier demonstrated the willingness and ability to meet the challenge and overcome formidable obstacles to accomplish the mission.[38] The doctrine, force structure, equipment, and soldiers supporting bridging operations resulted in outstanding responsiveness and mission completion.

Vietnam War Conclusion: Historical accounts of bridge units and river crossing operations during the Vietnam War complicates the forming of any substantial conclusions. Limited data on divisional bridge companies provided no substantial argument as to their usefulness, responsiveness, or utilization. The organizational change putting bridge companies in infantry divisions created fewer units at corps level. While capability was reduced, several accounts of critical and responsive corps bridging do not highlight any shortfalls. Several senior army leaders have been quoted that engineer bridge support during the war was adequate.

Normally in a historical study, conclusions are drawn from the analysis and appraisal of historical events. The

war in Vietnam marked the first major departure from the concepts of the FEBA and its extensive logistical lines of communication. Several factors, however, mitigate the requirement to develop conclusions about the war in Vietnam. Due to the immediate requirement for tactical troops, units were positioned with little regard for doctrinal concepts. Current doctrine, especially with respect to engineer organizations, was never tested in Vietnam and therefore is difficult to condemn.

The only conclusion that can be reached is that a mix of divisional and corps bridge units worked well. With regard to the future positioning of the bridge company, the lessons of Vietnam are best used to round out the historical perspective. Unlike World War II, it does not provide an accurate historical database from which to risk the success of future mobility support.

GRENADA AND PANAMA CONFLICTS:

With the engineer float bridge company still positioned at divisional level for all heavy divisions, the only change since the Vietnam War has been in equipment. Development and production began on the Ribbon Bridge in 1973 which was fielded in the late 1970's.[38] One hundred forty-four meters of the highly mobile, class-60 floating bridge was placed in each heavy division, replacing MAB's and M4T6. After developing excellent equipment and structuring bridge companies at the tactical level, the conflicts of the late 1980's did not demand their use.

FM 71-100, Division Operations, states that the primary role of the armed forces in low-intensity conflict (LIC) is to support and facilitate the security assistance program. This mission is normally accomplished by insurgency/counterinsurgency, combatting terrorism, peacekeeping operations, and contingency operations.[40]

Unlike conventional war, low-intensity conflicts involve the indirect application of military resources in support of primarily political and economic U.S. government initiatives. These forces conduct successful programs and actions pursuing a non-military strategy so a return to routine peacetime competition can be achieved. LIC is politically intensive, the goal is not to use direct force.

Peacetime contingency operations involve rapid employment of forces in conditions short of war to enforce or support diplomatic initiatives. Peacetime contingency operations are further subdivided into nine phases ranging from disaster relief to direct use of military force. When the ninth phase, direct use of military force, is employed, the operations move from a low-intensity conflict into conventional warfighting.

As a result, the use of tactical bridging in low-intensity conflict is a contradiction in terms. I will focus my analysis on the use of bridging in support of contingency missions resulting from the escalation of low-intensity operations. FM 5-100, Engineer Operations, does not outline specific bridging requirements for contingency

operations. Additionally, neither FM 100-5, (Operations), nor corps/division manuals address the bridging role. As a result, it is hard to gain a historical perspective on bridging operations in recent conflicts without a doctrinal baseline to measure it against.

U.S. operations in Grenada and Panama did not require engineer bridge companies. Both operations were short in duration and did not encounter a major enemy armored or mechanized force. Of the heavy units which participated, organic bridges were left at division home stations and served no functional role. I draw a preliminary conclusion, although not broadly based, that recent contingency operations do not confirm the need for divisional engineer bridge companies.

Although operations in Grenada and Panama did not require bridging, they were representative of contingency operations. The absence of bridge units infers some common concerns about these river crossing operations. Contingency operations will doctrinally require the majority of forces to be light infantry. Assault crossing boats, air assault, or airborne insertion will be used to secure the bridgehead on the far shore.

The construction of tactical bridging would have a limited role. Heavy forces would normally not be employed as they are relatively ineffective against insurgents' methods of fighting. If heavy forces reinforced, additional

shortcomings include slow and limited airlift deployment, rapid completion of mission and drag on the heavy division.

Air deployment of the engineer bridge company, with its full complement of equipment, would require more sorties than could be reasonably provided. Unless low intensity conflict allows pre-positioning of bridging assets, contingency missions must be planned independent of bridging equipment. Had Grenada and Panama required river crossings, adequate time existed to allow shipment by other means.

Even if the logistical problems of deployment were resolved, the expected duration of most operations would prohibit the likely use of float bridging. Grenada and Panama both reflected the AirLand Battle imperatives of speed, surprise, and agility. Light infantry forces establish objectives critical to the success of the operation and develop supporting movement plans. Maneuver forces will not incorporate into a closely synchronized assault a deliberate river crossing - they will develop alternate plans using air assault or airborne troops. The accomplishment of contingency missions will not pause for bridge transporting, building and crossing operations.

Bridge companies often impair the maneuverability of their parent divisions more than they assist it. Low probability of use, deployment concerns, and time needed for river crossing operations often mandate minimum tactical use. Heavy divisions assisting in LIC operations will habitually leave bridge units at home station. The 5th

Infantry Division, supporting Operation Just Cause, was forced to leave 113 personnel in Fort Polk, Louisiana - their bridge company. Because contingency missions would normally be planned at corps level, time and forces are available to incorporate into the operational plan. This would insure that responsive bridging capability is present while allowing increased flexibility to the division.

In summary, current tactical and engineer doctrine do not address float bridging in LIC contingency operations. Grenada and Panama provide the only recent exposure to contingency operations. Significant problems of inadequate airlift, short duration of mission, and negative impact on heavy divisions were present in these conflicts. These same concerns are likely to reappear in future LIC operations. After analyzing low-intensity operations in general and identifying specific problems posed in Panama and Grenada, one conclusion is evident. My review of historical documents concludes that force structure supporting contingency operations mandates placing engineer bridge companies at corps level.

OPERATION DESERT STORM:

The liberation of Kuwait in February 1991 by coalition forces removed the Iraqi army from Kuwait in accordance with United Nation resolutions. Although it will take historians years to compile a comprehensive historical base, I reached several conclusions from current information. There are three main areas of analysis:

geography, maneuverability, and availability of troops and time.

The geography of the Kuwait Theater of Operations (KTO) does not require massive bridging operations by divisional float bridge companies. The majority of operations were conducted in a desert terrain from Saudi Arabia northward into Iraq and Kuwait. The only requirement for bridging in the theater is the Tigris and Euphrates rivers inside Iraq. Such an offensive operation toward the Iraqi capital of Baghdad could easily be a corps-sized operation. These obstacles range from 200 to 400 kilometers from the forward edge of battle, providing significant time to develop and resource movement and crossing plans. Unlike the European theater where major rivers are found about every 15 kilometers, the KTO did not mandate that divisional battalions cross water obstacles to achieve mission success.

Maneuverability of the heavy brigade in the KTO strongly supports the absence of a float bridge company in the division. First, rapid deployment of divisional bridge companies stress limited sea and airlift resources. It was best to use these assets for combat equipment and troops. If the companies were not deployed, the divisional support package and command structure required that they be left at the home station. If the bridges were taken into the offensive, maneuver units would have been slowed.

Finally, if I were commander of any one of the four heavy divisions conducting the assault into known enemy

positions, I would gladly have traded the bridge company to corps for the chance to gain another organic engineer combat battalion for use in the assault.

The last area is the availability of troops and time. Operation Desert Storm started on 2 August 1990 with the ground attack commencing on 23 February 1991. In 6 1/2 months, operational planners wargamed all options, branches, and sequels needed to effect an allied victory on the ground. Had the bridge company been moved to corps, time was available to plan its effective use in conjunction with the overall plan. Had bridging been needed in central Iraq, transportation assets - both ground and air - were available to quickly move bridge boats and bay sections to the crossing site. Corps bridge companies would come under the control of an engineer group headquarters in support of an advancing corps. The proximity and span of control over the corps bridge assets would have been the same as the divisional company. The wide span of troops available, combined with the inordinate amount of planning time available, would allow for responsive bridging support to maneuver units.

CONCLUSIONS:

This chapter has taken broad look at engineer bridging operations conducted since the technological advances in mobility of the 1930's.

World War II provided an insight to massive river crossing operations conducted during a high level global war. Engineer bridge companies were located at corps level and best positioned to support the corps crossing plans.

The Korean conflict saw the revival of the engineer bridge company in the armored division but not to the more important infantry division. Although river crossing doctrine remained the same, a reduction in scope to a mid-intensity war raised new concerns. The lack of well-planned corps crossing operations and adequate bridging assets to support them left infantry divisions short on capability. In the example analyzed, the inability of bridge units to provide responsive support cost infantry lives.

The differing tactical and terrain considerations in Vietnam did not allow any significant conclusions to be reached as to the best location of the bridge company. For the first time since 1942, organic bridge companies were located in every heavy division. The majority of bridges, however, were constructed as sustainment missions with the tactical situation not demanding massive assault bridging for the advancing maneuver brigade.

While U.S. Operations in Grenada and Panama did not involve bridge companies, several insights can be gained concerning low-intensity conflict. Equipment changes in the 1970's brought the introduction of the ribbon bridge to all heavy divisions. The quickness, scope, and terrain of offensive maneuvers eliminated the need for any sort of

float bridge. Had river crossing operations been necessary, lack of airlift capability and the required speed of the advance would have mandated airborne, air assault, or assault (raft) methods.

Operation Desert Storm is the latest mid-intensity conflict which can be examined but historical records have yet to be completed. Based on available information for this type of, I conclude that bridge companies should be positioned at corps level. Bridges are hard to deploy, slow down maneuver mobility rates, and take manpower spaces away from badly needed sappers. Although some rivers exist, engineers have the capability, planning time, and bridge assets to insure there is not a detrimental impact on the maneuver units.

Like the Army of the 1930's and 1940's, current Army leaders are struggling with the problems of changing from a doctrine based on attrition to one based on maneuver. An understanding of the problems associated with development of bridging doctrine and equipment during the early war years may prevent the Army from making some of the same mistakes. Unfortunately, the historical vignettes do not all point to the same solution - they only provide examples of the kinds of challenges and successes which can be experienced. All of these lessons from history must be considered in addition to doctrinal and force structure implications.

CHAPTER FOUR - ENDNOTES

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CHAPTER FIVE

DOCTRINAL ANALYSIS

> I am tempted indeed to declare dogmatically that whatever doctrine the Armed Forces are working on now, they have got it wrong.[1]
>
> Michael Howard

OVERVIEW:

As Howard suggests, a good chance exists that an army's current doctrine may not adequately define how wars should be won. The recent unexpected political changes throughout the world, combined with a constant upgrade of technological developments, underscores the need to review existing doctrine.

The ability to function in the world of tomorrow is largely a function of the ability to anticipate and adapt. On the battlefield, the ability to adapt to changing technologies, threats, and missions will ultimately determine victory or defeat.[2]

The changing of warfighting doctrine, as well as river crossing doctrine, is currently ongoing in the U.S. Army. While satisfied with the principles of **AirLand Battle**

doctrine of the 1980's, **AirLand Battle-Future** provides a basis for evolution in doctrine, training, leader development, organization, and material development. New river crossing doctrine has evolved into a more force oriented than terrain oriented doctrine.

What are the impacts of these emerging new doctrines and how will they affect the ability of the divisional bridge company to support river crossings operations of the maneuver brigade? Both AirLand Battle-Future and the revised river crossing doctrine are untested, conceptual models which strive to improve the Army's ability to fight and win. Both are worthy of extensive research and continued analysis and as a result, not in the scope of my paper.

The goal of this chapter is to project what impact the doctrinal revision will have on the bridge company's ability to provide responsive support to the maneuver unit. I will highlight critical principles, tenets, and planning considerations which aid in the determination of the best bridge company force structure.

ARMY WARFIGHTING DOCTRINE:

General: An Army's doctrine is the vehicle which allows its forces to fight campaigns, conduct major operations, and win battles. It is the base from which procedures, tactics, organizations, and warfighting concepts are developed and refined. FM 100-5 states that while doctrine must be rooted in time-tested theories and

principles, it must also be adaptable to changes in the capabilities of the opposing force. It must be definitive enough to guide operations, yet versatile enough to accommodate a wide variety of worldwide situations.[3] Most importantly, to be useful and properly applied, doctrine must be understood and practiced by all.

In this section I analyze current doctrine and introduce the emerging warfighting doctrine of the future. I outline those tenets and principles which impact on river crossing operations and establish the framework in which those operations must be conducted to succeed. Following an overview of both doctrines, I identify those changes which will have an impact on river crossing doctrine. My goal is to provide a doctrinal background outlining the tactics, organizations, and procedures which affect the positioning of the divisional bridge company.

CURRENT AIRLAND BATTLE DOCTRINE

The Army's current capstone manual for warfighting doctrine is FM 100-5, orginally published in August 1982. It takes into acccunt historical theories and attempts to introduce a doctrine which is applicable to today's mix of joint, combined and tactical environments. The name 'AirLand Battle' signifies the importance in all operations of supporting air power on the side of one or both forces.

AirLand Battle doctrine describes the Army's approach to generating and applying combat power at the operational and tactical levels. It is based on securing or retaining

the initiative and exercising it aggressively to accomplish the mission. U.S. forces must control the battle imposing their will on the enemy. They must be able to throw the enemy off balance with a powerful blow from an unexpected direction, thus preventing the enemy from recovering and continuing operations aggressively.[4]

Scope of Operations: Units on the AirLand Battlefield will operate in several dimensions of space while conducting close, deep, and rear operations. At the tactical level, **CLOSE** operations comprise the efforts of smaller tactical units to win current operations. **DEEP** operations are defined in FM 100-5 as activities against enemy forces not in contact designed to influence future close operations. **REAR** operations are done behind the close battle insuring continuity of sustainment and command and control operations.

Tenets: FM 100-5 predicts that success on the modern battlefield will come to the army who displays certain attributes and fundamentals. The ability to adhere to the four tenets of **Initiative, Agility, Depth,** and **Synchronization** will determine the degree of victory. FM 100-5 defines them as follows:

o **Initiative** means setting of changing the terms of battle by action. It implies an offensive spirit in the conduct of all operations. Individually, it requires a willingness and ability to act independently within the framework of the higher commander's intent.

o **Agility** is the ability of friendly forces to act faster than the enemy and defined as the first prerequisite for seizing and holding the initiative. Greater quickness permits the rapid concentration of friendly strength against enemy vulnerabilities.

o **Depth** is the extension in space, time, and resources. In terms of space, it involves fighting the **deep** battle against follow-on forces and engaging main battle units in a **close** encounter. **Flank** and **rear** protection are critical to insure security of friendly forces. Leaders exploit tactical opportunities with **reserve** forces.

o **Synchronization** is the arrangement of battlefield activities in time, space, and purpose to produce maximum relative combat power at the decisive point. The product of effective synchronization is the maximum use of force, with every resource used where and when it is required.

Principles of War: British Major General J.F.C. Fuller devised ten principles of war in 1921 to guide his army in World War I. These time tested principles outline the critical areas which are fundamental to any successful tactical plan and operation. FM 100-5 offers a detailed explanation of how they apply to all military operations. In this section I will provide a doctrinal interpretation of the principles and discuss their relationship with river crossing operations.

The **OBJECTIVE** of a river crossing is to cross a water obstacle with overwhelming combat power to execute the attack. The ability of bridging units to focus their efforts on the rapid crossing maneuver units allows for an continued **OFFENSIVE** spirit and the ability to seize, retain, and exploit the initiative. Superior combat power must be concentrated at the decisive time and place, requiring bridge units to support forces crossing in **MASS.**

In the absence of unlimited crossing equipment and units, **ECONOMY OF FORCE** dictates that bridge companies must be carefully allocated when and where the tactical situation dictates. The proper positioning and employment of those companies will insure the freedom of action and sustainment of the initiative by friendly forces. This concept allows tactical units the ability to **MANEUVER** and apply combat power to place the enemy in a position of disadvantage.

River crossing operations require **UNITY OF COMMAND** to insure that all actions are focused on one common goal. The requirement to consolidate all elements of the combined arms team in support of a deliberate crossing mandates that command and control assets are focused on the rapid crossing of maneuver forces.

SURPRISE is the only principle of war which doubles as a river crossing fundamental. It is critical to a successful crossing by employing deception techniques to reduce the vulnerability of maneuver forces.

Although river crossing operations are considered one of the most complex missions a unit must conduct, **SIMPLICITY** is inherent to their success. Clear, uncomplicated plans and clear, concise orders must be prepared to ensure thorough understanding by all members of the river crossing team.

River Crossing Context: AirLand Battle requires offensive action, high levels of mobility, and audacity. Nothing impacts maneuver forces accomplishing these factors more than a major water obstacle. River crossing operations, within the context of AirLand Battle doctrine, restores the mobility needed for battlefield success.[5]

Close, deep, and rear operations support the AirLand Battle framework during river crossing operations. Close fighting includes the movement of assault forces up to, across, and away from the river securing areas for follow-on forces. Deep operations by Air Force and Army aviation elements, as well as long range artillery, prevent enemy reinforcement of far shore objectives. Rear operations are critical insuring both security of advancing maneuver units while providing logistical support and bridging bases. Traffic control from the rear to the river are key to the rapid movement of combat and combat support troops across the obstacle.

The tenets of AirLand Battle can be easily applied to successful river crossing operations. Maneuver units carefully select crossing means and sites allowing them to

retain the **INITIATIVE** and their own freedom of action. Engineer units providing responsive and effective support will allow a rapid crossing before the enemy can recover from the initial surprise.

AGILITY is essential for both the bridge and maneuver unit. Bridge companies must maintain the agility needed to adapt to changing river and threat conditions in addition to replacement of damaged bridge sections. Maneuver units retain a degree of agility by conducting a hasty crossing, thereby converting an attack into an exploitation.

River crossing operations require security, intelligence gathering and command and control activities throughout the **DEPTH** of the battlefield. The lengthy movement of maneuver forces will involve traffic control from rear areas across the river to far shore objectives.

SYNCHRONIZATION is probably the most essential AirLand Battle tenet to the river crossing operation. Assault and support forces must carefully synchronize all actions to ensure the crossing force produces maximum combat power at the decisive time. Extensive planning is required by engineers to insure that combat, combat support and combat service support forces act in unison.

EMERGING AIRLAND BATTLE-FUTURE DOCTRINE:

Overview: The Army is in a period of great change, coming from many directions and of many dimensions. Army doctrine must respond to that change by adapting new warfighting capabilities and techniques. Current AirLand

Battle doctrine has served the Army for the past decade and its fundamentals and tenets will remain essential to the development of future doctrine.

AirLand Battle-Future (ALB-F) is being designed to thrust the Army into the 21st Century with a specific window of application of 1995 to 2004. The doctrine is being developed to meet the needs of an army facing a multipolar world order and multidimensional threat, while considering the underlying realities of force and resource reductions.[5]

The emerging doctrine identifies and attempts to adjust to five major areas of change. First, while AirLand Battle is structured around and focused on a European type conflict, ALB-F recognizes global requirements of varying degrees of conflict. Secondly, ALB-F recognizes the reality of fiscal reductions and their impact on modernization plans and manpower levels. The Conventional Forces Europe (CFE) negotiations currently ongoing will outline the reduction of Army forces in Europe resulting from the collapse of the Warsaw Pact. Emerging technology in intelligence gathering and weapons will permit targets to be engaged at longer ranges and with greater lethality. The last key area of change is the nature of the threat. Political and civil unrest in developing countries have created potential worldwide threats possessing significant destructive capability.

AirLand Battle-Future proposes that a non-linear tactical concept is the answer to the numerous changes of

tomorrow's battlefield. A non-linear concept enables the Army to capture the benefits of new technology and at the same time, accommodate the changed threat while complying with the evolving and political constraints.[7]

Fundamentals of AirLand Battle-Future: The purpose of AirLand Battle-Future is to outline an approach to combat operations which uses the full potential of reasonably available future technology. The concept envisions the future battlefield as being nonlinear and greatly extended. It requires that the Army concentrates on the survivability, lethality, and operational capabilities of combat forces. ALB-F seeks to detect enemy forces and intentions early and to destroy them with massive indirect firepower. This concept requires avoiding an attrition battle in either an offensive or defensive role. The doctrine of AirLand Battle must support global requirements and not be focused on likely theaters of operation.

The battlefield of the future is expected to change in many dimensions. Major General Silvasy, U.S. Army TRADOC deputy chief of staff for Concepts, Doctrine and Developments recently established the groundwork for many of ALB-F concepts. He expects that forces of the future will fight on less dense, more open battlefields. This condition will come as a result of armies fielding fewer forces due to higher cost and arms control agreements. To conduct decisive operations, commanders at all levels will have to concentrate their forces resulting in additional risks.[8]

In addition to being more open, future battlefields will increase in lethality. Advances in weapons systems will allow high-value targets to be engaged at great distances with great accuracy. Intelligence gathering capabilities will allow forces detected and attacked long before they come within direct-fire range. Units not involved in combat operations must remain well to the rear of combat forces to enhance survivability.

Battlefield Concept: The basic thrust of ALB-F is to use high-technology collectors to find, track, and target the enemy for destruction by massed, long ranged, lethal indirect fires. Agile combined arms forces (heavy/light/special forces) will enjoy a mobility advantage to complete the destruction of attrited enemy forces. The actions taken by corps units following destruction of the enemy forces will fall into one of three general categories. These include regenerate and reset in the defense; commit and support exploitation forces in the attack; and preparation to assist in rebuilding the country following successful operations.

The geographical layout at corps level will be similar to current doctrinal frameworks. The speed with which forces can concentrate and the high volume of destructive and supporting fires they can bring to bear will make the intermingling of opposing forces nearly inevitable.[9] The primary focus of maneuver units differs from current doctrine in that the orientation will be on

destruction of the enemy force rather than retention of key terrain. Long range fires, increased air capability, and expanded areas of operations will blur the line between front and rear. All around defense will be essential and become the requirement of the clustered unit. Combat operations will be conducted in four general phases, each of which is described in further detail below.

PHASE 1 - Detection and Verification: The first phase is the early detection, tracking and targeting of enemy forces. The corps commander must receive timely and accurate information to allow him to respond to the tactical situation. Proper execution of this phase will increase destruction of enemy forces and enhance freedom of movement in later phases.

PHASE 2 - Fires: This phase employs all long-range firepower systems to destroy pre-determined enemy targets at maximum ranges. Successful intelligence preparation of the battlefield and targeting from phase 1 are synchronized by the corps fire control element. Massive indirect fires are used to destroy both enemy maneuver units and fire control elements.

PHASE 3 - Maneuver: After indirect fire and air defense systems have been eliminated, maneuver units will be committed. The corps area of operations will be divided into division sectors with brigades moving along selected routes to forward positions. When an attack is not feasible, brigades will occupy battle positions and attrite

enemy forces with supporting artillery fires. If the enemy is sufficiently weakened, the brigade will move directly into a hasty attack to complete defeat of enemy forces.

PHASE 4 - Recovery: Battlefield damage assessment teams will determine the status of weapons and vehicle systems. Corps transportation assets will arrive at forward units with replacement equipment and evacuate destroyed items to brigade or corps level.

Organizational mission changes: The design principles for AirLand Battle-Future are selected to create an agile division. All traditional division functions shift either up to corps or down to brigade.

The baseline corps organization consists of four maneuver divisions, a corps artillery, a corps aviation, and a COSCOM. A corps engineer brigade is included with other support units. The headquarters is both tactical and logistical with the primary function of synchronizing combat arms on the battlefield.

The heavy division consists of three maneuver brigades, a DIVARTY, a DISCOM, an aviation battalion and other support elements. The division is designed to be offensively oriented with the headquarters serving as a tactical headquarters only. Unlike the current relationship, brigades are aligned to the division headquarters based on the tactical situation with a division controlling a range of brigades. This arrangement is

designed to free divisions from coordinating supporting operations so they con concentrate on the fight.

The maneuver brigade is transformed into a more self-sufficient organization with additional organic units and a closer relationship to attached units. In addition to three maneuver battalions, the brigade will maintain a closer relationship with a reinforced Forward Support Battalion. The brigade engineer strength is currently unresolved and will be either an engineer company or battalion.

The important change in the organizational relationships is that the corps will be optimized for operations on the non-linear battlefield. The area of operations will be expanded and the corps will focus more on offensive based warfare to achieve operational goals. The intent is to use technology rather than forces to locate the enemy.[10] Air and ground elements will fix him and then mass to attack with fires and later maneuver forces. Operations will avoid a attrition battle.

IMPACT OF DOCTRINAL REVISION:

AirLand Battle-Future, while using many of the same tenets and time-tested theories incorporated into AirLand Battle, will drastically alter the way the army fights on the modern battlefield. Brigades will serve as the tactical maneuver element with divisions requiring the need to quickly tailor forces to meet a rapidly developing battle. Commanders at every level will emphasize centralized control and decentralized execution ensuring their subordinate units

combine at the right time and place to inflict maximum combat power.

Most operations will be planned and conducted by corps with divisions and brigades initially outside the combat area. Advanced technology and superior long range firepower and target acquisition capabilities will allow early destruction of enemy targets. Self-sufficient brigades will conduct rapid movements forward to defeat attrited units. Friendly forces will act in a non-linear mode selecting the optimum time and place to defeat the enemy.

For engineers, the effect will be somewhat mixed. Divisional engineers will work closer with the maneuver brigades while other engineer assets must be planned and co-located from the supporting corps engineer brigade. **Countermobility** tasks will be essential early in the battle. The battlefield must be properly shaped to ensure that enemy forces are detained during the 'fires' phase. **Mobility** tasks will take on more importance. The movement of maneuver brigades forward to the combat zone must be quick to support the rapid attack. Maneuver units will want to cross obstacles in stride to maintain momentum, creating the need for two breaches per task force.

Under normal circumstances, the crossing of a river is an administrative operation if it were not for one significant factor: enemy opposition. The importance of mobility in ALB-F places increased emphasis on the maneuver

units ability to project combat power across a river. Mobility operations will assume an unprecedented priority for combat engineers and the capability to conduct rapid, in-stride river crossings will be critical.[11]

It is important to analyze how AirLand Battle-Future will impact divisional bridge company positioning. Before that can be accomplished, however, it is necessary to review both current and emerging river crossing doctrine.

RIVER CROSSING DOCTRINE:

General: Like many other elements of the Armed Forces, the development of engineer river crossing doctrine is in a state of transition. Current doctrine taught throughout the army's school system addresses a four phase river crossing operation. Emerging doctrine, soon to be implemented, creates a five phase crossing operation oriented more on force than terrain.

In this section I review both current and emerging doctrine and analyze the impact of the change on the divisional bridge company. I hope to provide an insight into the doctrine, tactics, techniques, and procedures necessary to accomplish successful river crossing operations. I conclude the section by outlining several critical doctrinal planning considerations which affect the location of the division bridge company.

CURRENT RIVER CROSSING DOCTRINE:

General: A review of U.S. Army river crossing doctrine reveals that the nature of river crossings has not significantly changed since World War II. Current river crossing doctrine is contained in FC 90-13, Counterobstacle and River Crossing Operations.

The field circular focuses on the combined arms operations needed to counter and cross major obstacles and obstacle systems. It addresses all counterobstacle operations and provides generic planning procedures for crossing major types of obstacle systems. Execution of the crossing operations are discussed in detail along with an analysis of their relationship to the tenets of AirLand Battle doctrine.

Field Circular 90-13 identifies several classifications for different types of operations. Depending on the enemy situation and time available, three crossing categories delineate the type of crossing:

o Hasty: A decentralized operation using organic, existing, or expedient crossing means. They are conducted as a continuation of the attack with little or no loss of momentum by the attacking force. A hasty crossing is preferred over a deliberate crossing.

o Deliberate: A deliberate crossing is required when a hasty crossing is not feasible, has failed, or when offensive operations must be renewed at the river line.

These crossings may be forced by a significant river obstacle and a strong defending enemy or both.

o Retrograde: This crossing is required when enemy advances threaten to overwhelm the division, causing it to retrograde and subjecting it to an enemy pursuit.[12]

In addition to defining the types of crossing operations, FC 90-13 also outlines the phases necessary for successful completion. Execution of the counterobstacle operation is considered in four general phases although there may be no plan to conduct them as separate phases. These include: Advancing to the river, Crossing the river, Advancing from the river and Securing the bridgehead.[13]

FC 90-13 further subdivides the "Crossing the River" phases into three distinct components. The **assault crossing phase** includes rapid crossing of the river by assault forces, clearing the enemy direct fire from the exit bank, and preparing the exit bank for other forces to cross. The **rafting phase** moves support forces across the river to assist assault forces but does so slowly and without being vulnerable to enemy forces. The **bridging phase** moves large volumes of support to the assault force and the remainder of the division's combat power. This action is initiated after the threat of direct fires and observed indirect fires has been removed.

I do not attempt to address all the fundamentals, techniques and complexities in conducting river crossing operations in my research. What is important, however, is

to understand the significance of the doctrine on the divisional bridge company. The bridge company is only critical to the conduct of 'Crossing the River' with the other three phases primarily involving movement and security missions by maneuver units. Within the crossing phase, the bridge company will only be involved in the 'rafting' and 'bridging' phase because no ribbon bridge elements are needed for the initial assault. My analysis will therefore concentrate on the FC 90-13 doctrine involving these two sub-phases.

The principles of rafting and bridging operations do not differ significantly from those of any other major counterobstacle operation. What has always concerned commanders with crossing rivers is the significant degree of planning and control needed to successful complete the operation. The use of bridges to cross ground forces, when grouped with the need to coordinate additional corps level support, poses a significant undertaking. The vulnerability of forces on the water and the restrictions on movement imposed by limited crossing sites add to the problem. These critical issues make the planning and execution of major river crossing operations one of the most difficult battlefield activities.[14]

While FC 90-13 highlights the great successes of major river crossing operations in World War II, it states that the factor of time has forced many of the rules to change. The extensive amount of time needed to prepare for

deliberate crossings is unacceptable on the modern battlefield. Forces are much more vulnerable to sophisticated reconnaissance and surveillance techniques and long-range fires, including nuclear and chemical fires. Those factors, along with the need to maintain the initiative and ability to operate with agility, demand that U.S. forces be able to execute river crossing quickly and efficiently. All efforts must be focused on maneuver units crossing the obstacle without loss of momentum.

EMERGING RIVER CROSSING DOCTRINE:

General: The U.S. Army Engineer School published and distributed a coordinating draft of FM 90-13, Combined Arms River Crossing Operations in February, 1990. While still based on AirLand Battle doctrine as described in FM 100-5, it includes some significant modifications. Phasing of river crossing operations is significantly changed and basic fundamentals are established. The manual also incorporates recent developments in command and control for command post facilities and military decision-making. Finally, the revision implements the water crossing doctrine common to NATO forces.

Phasing: The draft FM 90-13 outlines some significant revisions over the superseded manual of 1987. Most significant is the change of river crossing operations from four to five phases. Previous doctrine addressed tactical objectives to eliminate direct fires (Exit Bank Objective) and observed indirect fires (Intermediate Objective). The

revised doctrine introduces the idea of establishing a linkage with a tactical objective (Final Objective).[15]

As a result, the new manual highlights the five river crossing phases as follows: Advance to the River, Assault, Buildup, Consolidation, and Attack out of the Bridgehead. The last three phases differ in both name and overall purpose from the phasing earlier described in the 1987 doctrine. These phases are clearly oriented on the mission beyond the river and have little impact on the question of bridge company positioning.

Fundamentals: The development of river crossing fundamentals is another important change in the doctrinal update and assists in engineer planning of successful operations. The manual points out that the fundamentals are characteristic of all successful river crossings because failure to incorporate these factors could seriously endanger the crossing. The fundamentals are:

SURPRISE: The range and lethality of modern weapons allows even a small force to defeat a larger one exposed in an unfavorable position. A deception plan is a key element of surprise as it may delay an effective enemy response to the true crossing.

EXTENSIVE PREPARATION: Supporting forces, including engineer battalions and separate bridge companies, must link up early. They immediately begin crossing preparations and are available to train the crossing force

during rehearsals. Their prompt alert and movement is critical.

FLEXIBLE PLAN: Even successful crossings seldom go according to plan. A flexible plan enables the crossing force to adapt rapidly to changes in the situation during execution. A flexible plan for a river crossing is the result of deliberate design, not chance.

TRAFFIC CONTROL: The river is a significant obstacle that slows and stops units, thus impeding their ability to maneuver. Traffic control is essential to cross units at the locations and in the sequence desired. Used to shift or hold units, it contributes to the flexibility of the plan.

ORGANIZATION: The commander organizes support forces from division and corps consisting of engineer, chemical, communication, military police, and other elements into a crossing organization. Procedures established must be clear, simple, and well rehearsed.

SPEED: A river crossing is a race between the crossing force and the enemy to mass combat power on the far shore. The longer the force takes to cross, the less likely it will succeed, as the enemy will defeat in detail the elements split by the river.[16]

Scope of Operations: The new FM 90-13 states that river crossings are primarily corps conducted operations. Corps assigns crossing missions and provides the necessary forces and equipment. Divisions normally assign bridgehead

objectives and control movement across the river. Brigades assault forces conduct the crossing independently or as part of a larger crossing force.[17]

A complete intelligence preparation of the battlefield will allow maneuver units to anticipate crossings well in advance. Adequate time is expected to be available for the conduct of detailed planning. Additionally, positioning of corps and division support forces will be accomplished with the maneuver brigade early in the operation. Based on this assumption of available time, maneuver units will have all required rafting and bridging equipment on hand at the initiation of the rafting phase.

Extensive Coordination: The new doctrine of FM 90-13 provides a detailed explanation of required coordination and planning for the engineer staff. Collective and individual tasks are outlined for every level of unit involvement, from corps to bridge crew.

If corps identifies the requirement for a river crossing, it is included in the warning order and the necessary river data and overlays are provided. The corps troop list will include necessary corps crossing assets.

The division engineer section and terrain team determine potential crossing sites after a thorough mission analysis. A threat defensive template are developed to identify possible weaknesses and areas vulnerable to counterattack. During course of action analysis, the staff

wargames each course of action against likely enemy responses. Branches and sequels are planned in the event of construction delays, loss of crossing sites, or traffic problems.

After receiving the division concept, brigades will convert the course of action into a detailed and well synchronized plan. The staff engineer must create a crossing plan, movement schedule and corresponding overlays. Coordination is done with the engineer battalion and separate bridge company to insure full understanding of the operation.

The bridge company commander is normally the crossing site commander responsible for crossing a battalion task force. He must coordinate traffic routes and holding areas, raft and bridge assembly, and logistical support considerations. The successful understanding of the overall mission combined with a workable and responsive plan is essential to the success of the river crossing operation.

IMPACT OF DOCTRINAL REVISION:

While emerging river crossing doctrine differs from current doctrine, there is little overall effect on the divisional bridge company. Several planning considerations outlined in both versions are critical to the success of the operation and the employment of bridge assets. Few of these doctrinal changes, however, have any significant impact on the question of bridge company structuring. In the following section I provide a summary of river crossing

planning considerations which specifically relates to the positioning of the bridge company at division or corps.

1. Crossing Front: Current doctrine states that the use of a broad crossing front is desirable because it reduces congestion and vulnerability. From a maneuver standpoint, a broad front is preferred because it will provide for rapid crossing of the force reducing the ability of the enemy to mass for a counterattack.

While a broad crossing front favors the commanders scheme of maneuver, it implies numerous crossing sites. A general rule of thumb for any obstacle breach is that at least two crossing lanes exist per brigade.[16] With only 144 meters of ribbon bridge organic to the division, the width of the river determines how many crossing sites a brigade can develop without requiring corps level support. If a division is conducting an offensive crossing with two brigades abreast, it is clear that unless the river is less than 38 meters wide (144 meters divided by 4 sites), external support is required.

KEY POINT #1: A division will normally require the use of a separate bridge company provided by corps to conduct anything more than minor crossings. Because these units are normally positioned several miles from the maneuver brigade, early coordination with the corps engineer brigade is essential. Without co-locating separate bridge companies with the maneuver brigade, there will not be responsive engineer support to the offensive operation.

2. Command and Control: One of the most difficult functions of the river crossing operation is effective command and control. Positive control over all elements during the concentration, on the near bank moving across the river, and dispersing on the exit bank increases the probability of success. There must be sufficient flexibility, however, to permit adjustments in the plan and changes during execution.

Doctrine states that the brigade executive officer will be the **Crossing Area Commander** serving as the maneuver representative in charge of coordinating and synchronizing all related activities. The complexity of river crossing operations involves use of the following division and corps resources:

- o Assault Forces
- o Airborne Forces
- o Air Assault Forces
- o Friendly Partisans
- o Engineers
- o Fire Support
- o Air Defense
- o Military Police
- o Communications
- o Intelligence
- o Combat Service Support
- o Electronic Warfare
- o Smoke
- o Deception

The senior engineer for the brigade is either the brigade staff engineer or in the case of a brigade as division main effort, the divisional battalion commander. This individual coordinates all engineer activities and serve as the brigade **Crossing Area Engineer.**

KEY POINT #2: The conduct of a major corps river crossing operation requires many resources. The mixture of brigade, divisional, and corps units all supporting one plan will create numerous coordination and synchronization

challenges. If the bridge company is positioned at corps, it can create habitual relationships with other supporting corps units and improve command and control challenges.

3. Training: FM 90-13 highlights the importance of the bridge company commander. It is essential for him to be fully involved in the detailed planning process and understand the significance of his responsibility. Failure to properly recon the crossing site, construct the raft or bridge in a responsive manner, or coordinate the traffic flow of maneuver units will impact on the success of the operation. It is important for the brigade engineer and bridge company commander to understand the capabilities and limitations of each other's assigned unit. Frequent training exercises between the two units will facilitate this understanding and increase the probability of success during actual operations. Conversely, the absence or reduced occurrence of regular training will not allow practice of combined security, movement, and communication tasks.

KEY POINT #3: Retaining the engineer bridge company in the division will allow continued habitual training relationships. Maneuver units will understand how the bridge company plans, conducts and controls the crossing operation. Maneuver vehicle drivers will also be allowed to practice rafting and bridge crossings.

Moving the company to corps level could create the possibility of a divisional post without a co-located corps

bridge company. Units will be unable to conduct combined arms training creating a lack of understanding of each unit's procedures, limitations, and capabilities. Actual operations will experience poor coordination and a lack of synchronization, resulting in non-responsive bridge support.

APPLICATION OF NEW RIVER CROSSING DOCTRINE TO AIRLAND BATTLE-FUTURE:

I have outlined current and emerging doctrine pertaining to how the army fights wars and crosses rivers. Before analyzing the impact the new doctrines will have on the divisional bridge company, it is essential to determine if new river crossing doctrine supports AirLand Battle-Future. This project is a significant undertaking in itself. As a result, I will only highlight major issues and concerns raised during doctrinal development.

There are several important issues which will affect the ability of the army to rapidly cross water obstacles of the future. First, the ALB-F battlefield will demand that agility and mobility will be essential to the maneuver unit. The ability to rapidly project combat power across water obstacles will take on increased importance to the success of offensive operations.

Advanced acquisition and targeting capabilities will increase the vulnerability of maneuver units and bridge assets during river crossing operations. The use of two lanes or bridges per task force will force friendly forces to concentrate and mass, thereby increasing their

vulnerability to enemy fires. River crossings, as currently planned, will create a lucrative enemy targets.

Recent studies on the relationship of new warfighting doctrine to river crossing doctrine have proposed several issues. One central thought is that ALB-F will demand river crossings to be more dispersed to increase survivability. Forces will cross on a broader front with brigades primarily in charge of crossing operations. Decentralizing crossing assets down to brigade level and forming multiple bridgeheads will not require the brigade to concentrate on a division bridgehead.[19] This theory proposes that a brigade could remain dispersed until concentrating on the brigade bridgehead, reducing exposure time over a division crossing. Several smaller crossings will maintain an element of surprise by not signalling the proposed division main attack.

Decentralization of crossing sites necessary to insure brigades freedom of movement will increase **command and control.** Engineer bridge forces will be either organic or habitually supporting resulting in unity of effort and enhanced coordination. The capabilities and limitations of each unit will be known and compensated for by its supported maneuver unit, thereby increasing the conduct of the overall operation.

Task **Organization** of combat and combat support troops will be easier to conduct under AirLand Battle-Future. The nature of decentralized operations will mandate that task

organization, command relationships, and sustainment packages will be determined and integrated before the brigade moves into the combat area. The assignment of supporting corps slice packages will include separate bridge companies assisting the crossing effort.

The predictable nature of offensive operations will allow engineers to determine early in the planning process how many bridge companies are required. This capability will allow much more **responsive** support to maneuver brigades. Current doctrine forces brigades to link up with division or corps assets during the course of the operation. ALB-F doctrine will insure that whenever the brigade moves forward to complete Phase III-Maneuver, bridge assets will assigned and co-located.

Finally, decentralized crossings controlled by maneuver brigades will enhance their ability to move on the battlefield. Friendly forces will be able to cross simultaneously and therefore quicker. Maneuver task forces can mass on the far side of the obstacle and rapidly continue offensive operations.

While the conduct of river crossings might enhance the capabilities of the maneuver brigade, the size and pace of the future battlefield might require **additional bridging assets**. The current force structure is already strained to support corps and division crossing sites. ALB-F proposes that all crossing operations be performed at the brigade level. This limitation will severely restrict the amount of

brigades which can be reinforced with corps assets. As a result, while flexibility and responsiveness are enhanced at the brigade level, they might be more constrained at the corps level.

One problem which ALB-F raises is the utility of the divisional bridge company. With brigades conducting independent crossing operations, divisional bridge assets could only support one brigade crossing. Other brigades will require the use of separate corps bridge companies. This mixture of assets will treat the divisional unit essentially as a separate bridge company. The advantage of the divisional bridge company supporting a divisional crossing area passing brigades in column will be overcome by doctrine. A force structure which required both corps and divisional bridge units, working independently, could be questioned.

Overall, emerging river crossing doctrine supports AirLand Battle-Future doctrine. The fundamentals and tenets of the revised doctrines still complement each other and are uniformly applicable. Rather than conduct operations as currently defined with battalion size task forces, ALB-F uses brigades. Centralized control and decentralized execution will become the key to success. The move of both doctrines on being force-oriented rather than terrain oriented is in line with the trends of emerging warfare. Any modifications to doctrine, tactics, procedures, or organizations will be minor and evolve as the requirement

demands. The baseline relationship between the two doctrines is sound.

CONCLUSION:

In this chapter I established that emerging river crossing doctrine will fundamentally support emerging AirLand Battle-Future doctrine. I introduced doctrinal issues affecting the conduct of river crossing operations and the divisional bridge company. I provided a background understanding on the many imperatives, fundamentals, tenets, and principles of both river crossing and ALB-F doctrine. In Chapter Seven, I will draw on this understanding to evaluate the doctrinal application of various bridge structuring options.

With a historical and doctrinal framework established, the only other critical element of the problem I must analyze are force structure implications. Chapter Six provides a force structure overview completing the understanding of the many variables which my research question incorporates.

CHAPTER FIVE - ENDNOTES

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[3]U.S. Army, FM 100-5: Operations (Washington, DC: U.S. Government Printing Office, May 1986), 6.

[4]Ibid, 14.

[5]U.S. Army, FM 90-13: Combined Arms River Crossing Operations--Coordinating Draft (Fort Leonard Wood, MO: U.S. Army Engineer School, February 1990), 1-3.

[6]Stephen Silvasy, Jr., "AirLand Battle-Future, The Tactical Battlefield," Military Review (February 1991):1.

[7]U.S. Army, "AirLand Battle-Future White Paper," Final Draft (Fort Leavenworth, KS: U.S. Army Combined Arms Center, 1990), I-2.

[8]Silvasy, 3.

[9]AirLand Battle-Future White Paper, III-3.

[10]Ibid, V-2.

[11]U.S. Army, "AirLand Battle-Phase III Base Case," Final Draft (Fort Leavenworth, KS: U.S. Army Combined Arms Center 1990), V-7.

[12]1U.S. Army, Field Circular 90-13: Counterobstacle and River Crossing Operations (Fort Leavenworth, KS: U.S. Army Command and Staff College, March 1987), 5-6.

[13]Ibid, 3-15.

[14]Ibid, 3-21.

[15]Wells, 11.

[16]FM 90-13, 1-3.

[17]Ibid, 1-1.

[18]Ibid, h-2.

[19]Wells, 16.

CHAPTER SIX

FORCE STRUCTURE ANALYSIS

> In the modern era, the problem of crossing rivers has increased even more. The large machines of war...require bridges for crossing rivers. At the same time these machines give defending armies the capability to mass force rapidly against river crossing attempts and to defeat the attempts at their most vulnerable time. The problem is, therefore, one of getting more combat assets across the river than the enemy can mass against the crossing. A country's river crossing doctrine, river crossing techniques, and available force structure must provide the solution to this problem.[1]
>
> Edwin J. Arnold, Jr.
> MMAS Thesis, 1985

OVERVIEW:

For years engineer commanders, staffs, and doctrine writers have tried to establish a force structure which focuses on improving support to the close combat heavy forces. Engineers need to give the maneuver commander responsive support to win on the modern battlefield.

In the mid 1980's several senior engineer leaders, inspired by MG Richard S. Kem, realized that engineer support to the close combat heavy combined arms team was not adequate.[2] The current force structure did not provide enough organic engineers to perform mobility, survivability,

and countermobility missions resulting in inadequate support for modern maneuver units. In addition to manpower shortfalls, engineer forces faced major problems with command and control of habitually assigned units, communications, maintenance, and logistics.

In an attempt to overcome these shortfalls, Kem and other senior leaders developed a concept of combining divisional and corps engineer forces. This resulted in the assignment of an engineer regiment organic to the heavy division. Initially known as "E-FORCE", the proposal is currently called the Engineer Restructuring Initiative (ERI). What was initially a planning concept is turning to reality as units in Europe and Korea are projected to undergo restructuring in the 1991-1992 timeframe.

Concurrent with the need to improve the engineer structure force is a requirement to reduce the active units of the U.S. Army. I mention force reductions only briefly as the pace and transition of this issue causes projections of future end strengths to change almost daily. While it is not within the scope of my research to design tomorrow's engineer force, it is important that today's senior leaders currently project a force reduction from 18 to 12 active divisions by 1995.

As a result, reductions in personnel, closure of military posts, and re-stationing of units mandate that now is the best time to change the engineer force. The army's need to reduce, combined with force structure changes

required by adoption of AirLand Battle-Future doctrine, allows perhaps the most opportune time to change the way engineers fight since the end of World War II.

In this chapter, I address three major issues: the shortfalls leading up to ERI's development, the enhanced support provided by the ERI structure, and an alternative solution - the corps bridge battalion.

Several detailed studies have been conducted on the ERI force structure proposal. My research does not attempt to re-evaluate and judge the proposal. I support the change and assumed in Chapter 1 that ERI will occur in all active heavy divisions by 1995. In this chapter I concentrate on how ERI impacts the bridge company and proposes to resolve critical deficiencies in support of close combat forces.

Current plans under ERI move the bridge company to the corps engineer brigade. I do not address that proposal here. Because my entire thesis addresses bridge company positioning, this chapter specifically looks at the enhanced command and control specifically offered by the divisional engineer regiment. Most importantly, I analyze the impact the regiment would have on the positioning of the bridge company and the increased gap crossing support that would be provided to the maneuver brigade.

SHORTFALLS OF CURRENT FORCE STRUCTURE:

In May 1990, the TRADOC Force Analysis Directorate at Fort Leavenworth conducted a detailed study of the ERI concept. The Engineer Structure Study reviews the numerous

shortfalls of the current force structure and previous modifications which were unsuccessful in improving known problems.

The study highlights how command and control in the divisional engineer battalion is overwhelmed by the task of coordinating responsive support to the maneuver division. Previous studies and long term experience in Europe show that each maneuver brigade in the forward combat zone requires at least one engineer battalion.[3] Additional experience gained at the National Training Center in Fort Irwin, California, reinforced this need for more engineers in support of heavy forces.

The need is normally met by attaching a corps combat battalion to the division engineer battalion. Significant differences in capabilities and equipment between the two battalions result in the creation of ad hoc task organizations. A maneuver brigade would receive the organic divisional engineer company then be augmented with a corps combat engineer company. Several significant shortfalls result in this structure including improper use of command relationships, shortfalls of engineer experience levels, problems with habitual associations, and a false sense of flexibility.

Command relationships: The direct support (DS) relationship causes three problems which prohibit effective and efficient use of corps engineer assets. First, the direct support relationship for corps engineers does not

allow the company supporting the maneuver commander to be further task-organized.[4] Second, the relationship creates the problem of having the corps company work for two commanders. Taskings are received from the maneuver commander as well as the corps combat battalion commander. Experience has shown this struggle results in inadequate and unresponsive support to the close combat heavy battle. Finally, the direct support relationship is usually violated as maneuver or engineer commanders change the relationship to OPCON, allowing further task organization. In an OPCON relationship, the responsiveness is faster than DS but continues to be impeded by equipment not compatible with that of the division engineer company.[5]

Experience levels: A disparity of experience levels creates additional command and control problems for the engineer leader. The divisional company commander who supports a maneuver brigade is responsible for controlling his own forces as well as orchestrating corps combat companies attached to the brigade. Normally a captain, he is overloaded by simultaneously serving as an engineer planner, executor, coordinator, integrator, and principal advisor to the brigade commander. Maneuver and artillery forces use lieutenant colonels to coordinate taskings, execute missions, and provide advice. The engineer company commander must overcome the differences in level of experience and rank between himself and battalion commanders to get into the inner circle.[6]

Habitual association: The success of habitual relationships between corps units and maneuver brigades is critical to the proper conduct of the combined arms team. It enables the maneuver brigade commander to mold the team he will go to war with - to put them through grueling drills that instill confidence and cohesion.[7] Current force structure and peacetime stationing prevents the corps engineer company from conducting effective and frequent training with the maneuver force. The brigade staff does not become familiar with the capabilities and limitations of the habitual force, preventing a "Train as you Fight" relationship.

False sense of flexibility: The original intent of the current structure was to allow the corps commander the freedom and flexibility to assign engineer forces as needed to weigh the main effort. The pace of AirLand Battle limits the utility of this concept as units seldom have time to rapidly shift efforts between divisions. The accelerated mobility required for AirLand Battle-Future intensifies this concern. As a result, the flexibility originally designed into the current engineer force structure is significantly reduced on today's battlefield.

Impact of Bridge Company: I have outlined several shortfalls of the current engineer force structure which ERI attempts to solve. In the conduct of my research, I found that the problems which led to the creation of ERI were primarily attributable to command and control challenges

between divisional and corps engineers with maneuver forces. The bridge company is not mentioned but I propose that brigade river crossings using the divisional bridge company simply magnify the need for a revised structure.

I have highlighted the massive burden placed on the engineer forces supporting a maneuver brigade. In addition to stretching the capabilities of the divisional engineer company commander, the brigade staff engineer (normally a major) assumes more forces and responsibilities than he is staffed or resourced to control. Supported with only a two-man staff, the brigade engineer is responsible for planning and coordinating all engineer activities of two to five engineer companies.

The massive workload associated with orchestrating a major river crossing, in addition to normal combat engineer tasks, is far beyond the capability of the brigade engineer cell. The additional control of the divisional bridge company, and the possibility of supporting separate bridge companies, traffic control, chemical, and fire support assets from corps, necessitates the resources of at least a full battalion staff. Although this scenario is not offered by proponents of ERI, it certainly outlines a worst case example demanding a change in current force structure.

ENGINEER RESTRUCTURING INITIATIVE (ERI):

While not affecting the basic principles of engineer combat operations, ERI changes the detailed 'how to' in the employment of corps and divisional engineer units to support

heavy forces.[8] ERI solves the shortfalls of the current force structure by regrouping the engineers into three smaller battalions organic to the division. Each maneuver brigade is supported by an engineer battalion organic to a new division engineer regiment. The resultant design enhances deployability and makes the maneuver force more lethal at the point of application.

Battalion level: ERI provides the appropriate level of engineer expertise, command and control, and advice to the division and brigade commanders. The 'Sapper' battalion organic to the maneuver brigade is a leaner organization capable of providing the resources to improve maintenance, communications, supply, and command and control. By bringing corps engineers into the division, ERI converts the habitual relationship into an organic relationship, thereby improving the brigade's 'go to war' posture.

Several advantages increase the responsiveness and support offered by the divisional battalions. The distances over which its subordinate elements operate are reduced to one brigade's area as opposed to current structure which spreads a battalion over a division sector.[9] The engineer battalion commander with the rank of Lieutenant Colonel now has the experience and rank of other maneuver and fire support commanders within the maneuver brigade. The use of a full battalion staff greatly improves the resources needed to coordinate mobility, countermobility, and survivability missions supporting the heavy force. The staff is trained

and sized to plan and conduct a major river crossing operation involving numerous bridge companies from either division or corps level.

Regimental level: The new regimental engineer commands or controls the organic combat engineer or "sapper" battalions and corps engineer assets assigned to provide area support to the division. With resources commensurate with his responsibilities, the headquarters eliminates many of the tasks previously passed to a corps engineer group. As a result, the regimental commander has complete control over all engineer assets within the division sector.

Corps Brigade level: Since ERI reduces the need for corps engineer units forward of brigade rear boundaries, the corps engineer is better able to plan and resource the next battle envisioned by AirLand Battle-Future doctrine. Because corps units are no longer enmeshed in the brigade fight, the time required for them to disengage, move, and link-up with another division is much less.[10] ERI doctrine envisions this additional capability increases the flexibility of the corps commander thereby increasing his freedom to maneuver.

Proven results: The engineer school bulletin describing ERI to engineer officers and soldiers states that ERI fixes a battlefield deficiency that has persisted for almost 50 years.[11] While concepts are easy to support, ERI has undergone recent tests proving that the organizational change provides better support to maneuver forces.

Numerous rotations at the National Training Center with engineer forces configured in the ERI structure affirm the improved command and control, combat effectiveness, and flexibility of the combat engineers at corps level and below. Engineer battalions structured with ERI divisional and corps assets performed magnificently during Reforger 88 and Reforger 90.

Lessons learned from these exercises proved that in addition to providing more sappers in the forward area, several command and control improvements resulted. The engineer battalion staff provided improved co-ordination and planning for integrated engineer combat operations and timely logistical support to sapper companies.[12] The engineers task-organized sappers easier under ERI due to the presence of the engineer battalion staff which provided a critical additional engineer control element.

ERI's impact on bridge company: In the early versions of the ERI concept, the divisional bridge company was retained under the engineer regimental control. If the division faced a river crossing, the bridge company would be task organized to the engineer battalion supporting the division's main effort. If additional bridge assets were required from corps, they would likewise be attached to the engineer battalion of supported brigades. As a result, command and control was increased with little actual impact on the doctrinal employment of the bridge company.

I am unable to pinpoint when and why the ERI proposal deleted the bridge company from the division engineer force structure. I would assume the retention of the unit created an unsupportable ratio of engineers in the division force structure. During my analysis of pre-World War II force structure changes in chapter four, I explained how this rationale was used to move the bridge company to corps level.

As a result, few recent exercises testing the ERI structure used the bridge company to test river crossing command and control. Reforger '88 is the only documented case I could find where a ERI battalion force structure attempted to incorporate river crossings into the tactical scenario. The 10th Engineer Battalion and the 237th Engineer Battalion (Combat)(Corps) joined in support of the 3rd Infantry Division to test ERI command and control.

The 10th Engineer Battalion supported 1st Brigade and the Task Force (TF) 237 supported 2nd Brigade. Each brigade received two companies from the divisional battalion and one from the corps battalion. While the divisional bridge company remained under division control, TF 237 performed all planning tasks associated with a major river crossing. The brigade staff made eight contingency plans for the division counterattack including one involving a crossing of the Main river.

After action reports outline the success with which the engineer battalion staff aided in the crossing planning.

TF 237 headquarters coordinated, reconnoitered, and planned engineer support, communications, traffic control, and bridge construction. The TF 237 S4 planned logistical operations far beyond what the brigade engineer or the regular direct support company commander could have done.[13] Although detailed information on the success of the Reforger '88 river crossing exercise is unavailable, I support the conclusion that an engineer battalion staff can provide much better command and control than a company commander.

ANOTHER ALTERNATIVE - THE BRIDGE BATTALION:

As engineer commanders, doctrine writers, and senior leaders modified and adjusted the ERI concept, other engineers proposed independent solutions to the command and control problems of the current engineer force. One engineer commander has proposed a solution which resolves force structure issues among bridging organizations by consolidating subordinate units under a bridge battalion headquarters.

Lieutenant Colonel Paul G. Munch is the battalion commander of the 565th Engineer Battalion, the only active component bridge battalion in the U.S. Army. In his article titled 'The Engineer Bridge Battalion', Munch focuses attention on the unique and formidable bridge battalion in solving command and control problems.

Chapter 1 outlined the three options which my study analyzes and evaluates. My option # 3 - **Assign the divisional bridge company to a Corps Bridge Battalion**

removes the organic bridging asset from division level. The proposal assumes ERI is implemented and all the advantages listed earlier in the chapter are realized.

Munch reinforces many of the attributes of my Option # 3 in proposing increased opportunities and responsibilities for the Engineer Bridge Battalion. Although he does not recommend the removal of the company as my option # 3 proposes, his article discusses many of the advantages gained from centralized control of bridge assets.

The engineer bridge battalion controls 60 percent of a three division corps' float bridge assets. In addition to 640 meters of organic ribbon bridge, the battalion headquarters provides command and control over bridging operations. When augmented by corps combat service assets in wartime, the unit would control river crossing operations for the entire corps area of operations.

The battalion relieves the divisional engineer from the burden of planning, controlling and resourcing gap crossings allowing him to concentrate on managing combat engineer assets in the forward area.[14] Experienced and knowledgeable staffs provide planning assistance, coordination, and advice to the maneuver commander. By providing a trained officer as the staff engineer to the crossing force and crossing area headquarters, the maneuver force can take advantage of increased experience, expertise, and training to improve synchronization and control.

Bridge Battalion Evaluation: To test this concept,

the 565th Engineer Battalion formed a composite task force of divisional and corps assets during Reforger 1988. Exercise Certain Challenge grouped the normal units of the bridge battalion with an attached divisional bridge company from the 1st Infantry Division, Fort Riley, Kansas. The battalion had the dual mission of commanding three to five companies and providing bridging expertise to other maneuver and engineer headquarters.

LTC Munch and the battalion staff worked closely with maneuver units anticipating a possible river crossing operation. Munch uses the example of supporting the 2nd Brigade, 3rd Infantry Division to demonstrate the capabilities of his unit. The battalion staff refined a deliberate river crossing plan for the Main River involving an opposed/dismounted infantry assault and three assault float bridge crossing sites.[15]

The battalion staff formed two organizations, a small planning cell of experts to assist crossing force and crossing area commanders as well as an operational task force. Named "Task Force Remagen", the unit commanded its own two corps-level bridge companies, two divisional ribbon bridge companies, a mechanized combat engineer company, a military police platoon, and smoke assets. The task force reported directly to the crossing force commander and essentially controlled all aspects of the river crossing operation. Planning culminated in a detailed rehearsal with the maneuver and engineer commanders prior to the exercise.

Lessons learned: Several important lessons resulted from the exercise showing the importance of the bridge task force as well as identifying unit challenges which needed to be resolved. Of the seven major lessons Munch points out, I will analyze the two which impact on my research question.

The lesson most important to the effective support of the maneuver brigade involved command and control. Munch points out that the exercise underscored the absolute need for battalion level command and control for corps level bridge companies. When the separate companies were attached directly to a group or brigade headquarters, they were often poorly neglected or poorly employed.

> The rapid pace of the battle, and the maneuver elements' urgent need for engineer support, nearly always forced the senior engineer command and control headquarters to focus their attention on the activities of their combat engineer battalions located in the forward areas.[18]

The bridge battalion, however, was able to focus all of its resources and planning staff on the successful conduct of the river crossing operation. The supporting corps and division assets were integrated into a synchronized plan allowing the bridge companies to be more responsive to the maneuver commanders. The bridge battalion staff was able to provide the degree of command and control necessary to accomplish the mission than if the units had been assigned directly to a brigade headquarters.

The second lesson which impacts on my evaluation of bridge positioning options involved training. The unique

river crossing expertise found in the battalion proved invaluable in planning and conducting river crossing operations.[17] The smooth and efficient conduct of crossing a maneuver unit across a major water obstacle requires the use of that bridge battalion staff's experience and training. Throughout the exercise there was a constant demand for operational knowledge at both the crossing area and crossing force level.

To reiterate, LTC Munch does not advocate eliminating divisional bridge companies. The point of his article, and the thrust of Exercise Certain Challenge, was to prove the utility and worth of the corps bridge battalion. While Munch does not suggest it, I inferred from his article that he would propose the structuring of a bridge battalion in every corps engineer brigade.

Although this concept is independent from the research question, the lessons learned with the 565th Engineer Battalion do support key aspects of designing a optimum force structure for the divisional bridge company. After examining Munch's viewpoint, I conclude that a bridge battalion can provide the required flexibility, capability, and responsiveness desired by the maneuver commander on the future battlefield.

CONCLUSION:

In this chapter I provided a review of tactical and operational shortfalls of the current engineer force structure. I outlined key concepts of the Engineer Restructuring Initiative and explained how an improved force structure will resolve today's current limitations and weaknesses. Finally, I offered an insight on the success of improved command and control when individual bridge units, whether divisional or corps, are placed under a centralized battalion structure.

My overall conclusion is that while ERI is a much needed force structure improvement for the combat engineer, it does not have any serious impact on the placement of the divisional bridge company.

The assignment of an engineer battalion staff to support a maneuver brigade greatly increases the planning and control capability of engineers to conduct successful river crossing operations. This improved command and control headquarters, however, will provide improved support regardless of whether the bridge company is assigned to division or corps. It increases the number of combat engineer planners in the maneuver brigade but does not equate to the expertise and flexibility offered by consolidating bridge units into a bridge battalion.

In summary, the additional command and control offered by ERI will undoubtedly improve support of engineer operations to the maneuver brigade. The bridge battalion,

however, offers equal numbers of engineer staff members but provides a structure which is tailored, trained, and highly proficient in the conduct of river crossing operations. Perhaps it is time to structure bridge assets to take advantage of the bridge battalion's expertise.

CHAPTER SIX - ENDNOTES

[1]Edwin J. Arnold, Jr., "American River Crossing Doctrine: A Look at its Compatibility with Current Force Structure and the Modern Battlefield," (School of Advanced Military Studies Monograph, U.S. Command and General Staff College, 1985), 2.

[2]MG Richard S. Kem, LTC J. Richard Capka, and MAJ Houng Y. Soo, "E-Force - An Update," Engineer, Vol. 18, No. PB 5-88-1 (July 1988): 7.

[3]Ibid.

[4]U.S. Army, "Engineer Structure Study - Executive Summary" Vol. 1 (Fort Leavenworth, KS: U.S. TRADOC Analysis Command, May 1990), 1-2.

[5]Ibid, 1-3.

[6]Kem, 8.

[7]Ibid.

[8]U.S. Army, FM 5-71-100: Regimental Engineer Combat Operations-Coordinating Draft (Fort Leonard Wood, MO: U.S. Army Engineer School, February 1991), 1-1.

[9]Ibid, 1-2.

[10]Ibid.

[11]Richard G. Stowell, "Son of E-Force," Engineer Officer Bulletin, No. 12 (January 1991): 9.

[12]Dominic Izzo, "Trying out E-Force Command and Control," The Military Engineer, Vol. 81, No. 527 (March-April 1988): 18.

[13]Ibid, 17.

[14]Paul G. Munch, "The Engineer Bridge Battalion," Engineer, Vol. 20, No. PB 5-90-1 (March 1990): 13.

[15]Ibid, 15.

[16]Ibid, 17

[17]Ibid.

CHAPTER SEVEN

BRIDGE COMPANY ALTERNATIVES

> While the fundamental doctrines of combat operations are neither numerous or complex, their application is sometimes difficult. Knowledge of these doctrines and experience in application provide all commanders a firm basis for action in a particular situation.[1]
>
> GEN George C. Marshall
> June, 1944

OVERVIEW:

In this chapter I present an evaluation of the options considered. To review, chapter three established a decision methodology which outlined my evaluation variables, decision-making tools, and various weightings of required criterion. Chapter four provided a historical background relating critical lessons learned from 50 years of bridging operations. Chapter five outlined key warfighting and river crossing doctrine analyzing impacts between current doctrine and emerging doctrine. Chapter six reviewed force structure identifying critical aspects of the Engineer Restructuring Initiative and force reductions.

As a result, I have established a solid framework of various historical, doctrinal, and force structure factors which will assist me in ranking the eight previously established criterion. Each criterion will be studied with a determination made as to which option best supports the goals of the criterion.

Ranks will be applied to four decision matrices: unweighted, maneuver weighted, engineer weighted, and my personnal weighted version. It is not my intent to satisfy all readers by showing recommendations of special interest groups, therefore, my own solution is the one which I will present. The intent of showing other recommended solutions is to represent divergent views. I will comment on possible variances from my solution.

I conclude the chapter with a copy of a blank decision matrix to whic' the reader can apply weights and rankings. While my individual rankings are based on current knowledge and tactical application, future doctrinal or force structure changes may require a slight variation of criteria weights. The blank matrix will allow new recommendations to be drawn from the same baseline body of knowledge I have developed throughout the work. My final recommendation is presented in chapter eight.

CRITERION RANKING OF OPTIONS:

1. **RESPONSIVE SUPPORT:** Engineer bridge assets must be available when needed, not on call far back in the march column. As a result, the responsibility of combat engineers

to provide RESPONSIVE bridging support remains one of the most essential mobility tasks. While other elements of criterion I have outlined are important, I consider the requirement for bridging units to be responsive to the needs of the maneuver commander to outweigh all other factors.

My analysis of both AirLand Battle-Future doctrine and future river crossing doctrine stressed the need for maneuver units to quickly project combat power across water obstacles. While moving to destroy enemy forces during the maneuver phase, mobility across rivers is essential to insure maneuver units can reach the engagement area on time. Failure to accomplish this task will allow enemy forces to fix and destroy maneuver brigades while negotiating the river obstacle.

BEST CHOICE - OPTION # 1: I believe the general proposition that support capabilities organic to the division are normally more readily and rapidly available to satisfy developing requirements in the division sector than are non-divisional support capabilities.[2] It is true that given adequate information and time to plan and resource a major crossing, bridging assets from corps can be task-organized to the brigade and provide equally responsive support. My concern, however, involves the unexpected river or unknown destruction of existing bridges. Without a bridging capability in the division, maneuver brigades would be limited in their ability to cross independently, thus resulting in possible destruction of maneuver assets.

Organic bridging assets will normally be within the division area of operations and more capable of responding to an urgent requirement for bridging. Even if the crossing requires additional assets, initial divisional ribbon bridge rafts could transport critical assault vehicles across the river to increase firepower on the far bank. As the uncoordinated crossing of the Kumho river displayed in Chapter 4, the absence of bridging when and where it is required could result in serious loss of friendly units.

SECOND CHOICE - **OPTION # 2:** I selected the separate company option as the second choice based on the fact that with the brigade still in charge of the crossing, corps assets will be coordinated and assigned early enough to provide responsive bridging support. While not as desirable as having organic assets, a habitually assigned bridge company from the engineer brigade could afford the same support if properly integrated into the plan. If the divisional company is shifted to corps but remains on the same installation, a close relationship can develop between the bridge company leadership and divisional engineers. Knowing the capabilities and limitations of a support unit allows the maneuver unit to compensate for shortfalls in efficiency and capability. Additionally, the habitual peacetime relationship of one corps bridge company to a maneuver division might increase the possibility of every division receiving some bridge support in a corps operation.

This option would allow centralized control at corps level but decentralized execution to the maneuver brigade.

THIRD CHOICE - **OPTION # 3**: The major advantage of consolidating bridge assets into a bridge battalion is to provide the corps commander the flexibility to weigh river crossing support to assist the corps main effort. While this concept increases the overall responsiveness to the corps operation, any division conducting a supporting or reserve mission might not receive adequate bridging support. As a result, I predict that while limited units would enjoy a higher priority of support, several maneuver brigades would not receive the bridging capability needed to rapidly cross water obstacles.

OPTION # 3 transfers river crossing command and control to the bridge battalion. River crossing operations would be completely planned and executed by the bridge battalion headquarters. This scenario assumes that the centralized control and technical planning expertise would increase the success of crossing operations. While this theory is valid for the deliberate, highly predictable crossing, it could have serious repercussions for the unexpected crossing. Once a division identified a crossing requirement, the corps battalion task force would have to be mobilized, move forward to the crossing site, and coordinate and control all aspects of the crossing. The ability to rapidly synchronize brigade, division, and corps units on short notice to conduct a complicated river crossing is

questionable. As a result, the ability of a corps bridge battalion to provide responsive bridging support is limited. The key to responsive support is organic assets found well forward on the battlefield.

2. **OPTIMUM UTILIZATION:** Float bridge assets, regardless of where they are located, are a limited and valuable requirement. Current and future AirLand Battle doctrine places additional premiums on the bridging units in which ribbon bridge equipment is located. It is clearly in the best interest of both engineers and maneuver units to establish a force structure which insures the optimum utilization of float bridge assets.

BEST CHOICE - OPTION # 3: Assignment to a corps bridge battalion best insures full and effective utilization of available assets. In accordance with AirLand Battle-Future doctrine, corps commanders have more flexibility to shape their operational plan. The corps commander gains full control over as many as eight bridge companies and employs them as needed to support the tactical mission. Numerous companies can be assigned to the division conducting the main attack thereby decreasing the crossing time and corresponding window of vulnerability. Bridge assets currently organic to reserve or follow-on divisions could be employed in mass rather than be underused in the rear.

The recognition that the mobility challenges of the battlefield will include both wet and dry wide gaps brings with it a recognition that matching assets with requirements

can be done only at a level which has command and control of both fixed and float bridge assets." Doctrine emerging under ERI would propose that the proper level be corps. Locating both fixed and float bridging equipment within the same battalion would improve the bridge replacement process and insure float bridges are quickly replaced and moved forward. With all bridge assets under one commander supported by a full staff, resources could be shifted faster due to increased command and control.

The bridge battalion would afford more flexibility to the operation than option #2, the Separate Corps Company. When additional assets were required, coordination through the engineer brigade and subsequent relocation of dispersed bridge companies would be timely. As a result, optimum use of the bridge assets would not happen and crossing time of the corps would be increased.

SECOND CHOICE - **OPTION # 2:** Centralization at corps and increased flexibility to the corps commander is still essential in spite of increased command and control challenges. The engineer brigade staff would have visibility of corps river crossing progress and divert or reinforce critical crossing sites with corps assets. With most crossing operations requiring corps support anyway, the scope of support would simply be increased.

Chapter 4 highlights the historical importance of corps centralization of bridging assets during Patton's 3rd Army crossing of the Rhine. With total control of bridge

assets, he massed forces and used differing allocations of equipment to match the tactical situation.

THIRD CHOICE - **OPTION # 1:** Retaining the bridge at division level is the least desirable choice with regard to full use of bridge assets. Every division is insured crossing support but divisional assets are not able to weigh the corps' main effort. Without massing assets at corps level, every division would have to emplace and recover its own organic bridges as it advances toward the objective. Confusion at the bridge site between major units could be expected. Divisions not in direct action would either retain an unused bridge unit or lose it to another division, creating additional command and control problems.

3. **COMMAND AND CONTROL:** One of the essential elements of successful river crossing operations is effective command and control over all participating combat, combat support, and combat service support units. While current doctrine assigns total responsibility for coordination to maneuver units, my options offer a new alternative. Option # 1 and # 2 both retain control with the maneuver brigade. Option # 3 transfers the control of river crossing operations to a bridge task force provided by the corps bridge battalion. This difference in responsibility allows me to analyze which command and control structure best supports river crossing operations.

BEST CHOICE - **OPTION # 3:** I have stressed many times throughout my research the need for several corps assets to

support a major river crossing. Numerous bridge companies, traffic control assets, chemical smoke platoons, fire support augmentation, and service support elements must all be synchronized to insure a coordinated operation.

The centralization of bridging assets into a corps bridge battalion would bring into sharp focus the delineation of responsibility concerning overall control of assets. The bridge task force staff would develop and implement a coordinated plan capable of crossing maneuver units. Division and brigade staffs would be relieved of the planning burden of river crossing operation and be able to focus on the tactical movement across the obstacle. The result would move bridge task forces independently in advance of maneuver units to rapidly construct bridges just prior to the arrival of crossing forces. In effect, these corps bridge task forces would function independently on the dispersed battlefield , responding to various missions to establish bridgeheads for moving maneuver brigades.[4]

With corps assets responsible for the crossing operation, control of the crossing site would not have be transferred from division to division. This common control headquarters insures adherence to one of the river crossing fundamentals, UNITY OF COMMAND. Corps maneuver and support elements will be able to pass through the crossing area responsible for only their internal communications and traffic control.

SECOND CHOICE - **OPTION # 1**: The ability of maneuver brigades and division staffs to properly command and control river crossings has been tested and tried over the last several years. While not capable of controlling major river crossings involving numerous bridge companies, brigade staffs have sufficient resources to plan normal crossings involving the organic company and one task-organized corps bridge company.

Knowing the capabilities of the division bridge company greatly assists the brigade staff in planning its effective use. Organic assets can be positioned on the critical, most time-sensitive crossing site with the corps bridge company supporting secondary crossing sites. The permanent assignment of a bridging asset to the division allows the maneuver staffs unlimited training opportunities to perfect coordination and synchronization procedures. Because the command and control cell is organic to the maneuver brigade, a delay or absence of corps bridge assets will not limit the flexibility of the maneuver commander.

THIRD CHOICE - **OPTION # 2:** Assignment of the bridge company to the corps engineer brigade as a separate company results in the least favorable command and control relationship. Without an organic divisional bridging capability, all required bridge units would be task-organized to the maneuver brigade. The ability of the brigade staff to effectively employ the corps bridge companies in an integrated crossing plan would be limited.

The ability to train in river crossing exercises would be restricted to the availability of corps bridging support. As a result, proficiency in planning and conducting crossing operations would be degraded due to a decreased sense of mission focus.

4. **BRIDGE VULNERABILITY:** In the past, engineers had adequate bridging assets to function in the limited area of Western Europe. The offensive nature of AirLand Battle-Future and the increased lethality of weapons systems will likely require an increased level of protection of both assault and line of communication bridging assets. It will be critical to balance the increased vulnerability of an asset against forward positioning to insure responsive support.

BEST CHOICE - **OPTION # 2:** The assignment of the bridge company as a separate corps bridging asset reduces the vulnerability of valuable bridging equipment. Normally positioned in the corps rear, bridge equipment would be out of range of enemy direct and indirect fires. When task-organized to the supported maneuver division, adequate security elements would be available in sector to prevent enemy strength massing at the crossing site. With the distinction between forward and rear areas being harder to define, the threat still exists for damage while corps units are moving forward.

SECOND CHOICE - **OPTION # 1:** Current and future engineer and maneuver doctrine would lead me to predict that

the bridge company would be normally found closer to the FEBA than if were located at corps level. As a divisional element, it can be argued that the ribbon bridge company would suffer greater exposure than it would if it were at echelons above division."

Conversely, the decentralization of units normally produces added dispersion of assets. While primarily a function of unit operating procedures, elements of the divisional bridge company will be positioned in accordance with the division plan and exhibit better security techniques.

The increased dispersion does not offset the increased target opportunites of forward positioning. A divisional bridge company is vulnerable whenever it is in the main battle area while a corps asset is vulnerable only when it is called forward to support maneuver forces.

THIRD CHOICE - **OPTION # 3:** In the analysis of the first two choices, I used the logic that corps units farther from the battle are less vulnerable and divisional units are more vulnerable. That logic breaks down when the corps bridge battalion is analyzed.

With all bridge assets assigned under the corps battalion, those assets would normally be massed as needed to support the corps main attack. This high concentration of critical bridge assets would present a lucrative target for the enemy. Security elements normally provided by maneuver units in a divisional crossing would have to be

coordinated between division and corps. Possible confusion during the link-up, assignment of security elements, or delay in moving bridge assets into crossing sites all increase the probability of enemy detection. The deception plan and element of surprise might be compromised by the difficulty in camouflaging the large quantity of bridging equipment.

5. TRAINING: The criterion of 'Training' involves two critical areas, the collective training of soldiers assigned to the bridge company and the familiarization of maneuver units using bridging equipment and developing crossing plans. While collective training is improved by centralization, familiarization of maneuver units is enhanced by decentralization. This trade-off requires a great deal of subjective judgement in ranking various options.

BEST CHOICE - **OPTION 1:** The best way to fight and win on the battlefield is to train as you fight. Leaving the bridge company in the division best satisfies this axiom. Continued co-location of bridge units enables maneuver units to plan, coordinate and conduct realistic bridge training with their organic bridge unit. Soldiers learn the complexities of crossing bridges and rafts as well as rehearsing traffic flows and actions in holding areas and staging areas. Training exercises can increase the proficiency of drivers under the cover of smoke, during

nighttime maneuvers, in inclement weather, or simulated enemy direct fire.

Division and brigade engineers would work closely with maneuver commanders and staff to train in the planning and execution of river crossing operations. Major training events would exercise the ability of staffs to plan traffic control plans, develop vehicle crossing charts, and synchronize fire support, smoke, and maneuver unit crossing. The ability to exercise with the same bridge company that would provide support during war would enable the leadership of both bridge, engineer and maneuver elements to understand each other's capabilities and limitations. Realistic work rates and crossing times which reflect the true abilities of the brigade could be developed.

While training with maneuver forces would be enhanced, collective training of bridge crewman would suffer. The bridge company would be the only unit of its type on a divisional post, creating a unique concern of training low-density specialties. Special training programs capable of being resourced in a corps bridge battalion would not exist. Although proficient in working with maneuver forces, the extent of training and the proficiency of the unit would be limited to the initiative and resources of the company staff.

SECOND CHOICE - **OPTION # 3**: Moving the bridge company to the corps bridge battalion would result in stronger training programs for all bridging units. With numerous

companies of the same military occupational specialty, battalion size training programs could improve both individual and collective skills. The availability of expanded resources and a full battalion staff would greatly assist this effort. The focus of both the battalion commander and the operations staff would work on Mission Essential Tasks increasing the overall training status of the battalion.

In this option, the problem of training on the planning and conduct of river crossing operations is significantly reduced. With a corps river crossing, the corps bridge battalion will perform the planning and synchronization of all river crossing operations. The role of the maneuver brigade would be significantly reduced. Rather than devised and supervising the operation, the brigade would conduct a 'tactical movement' through the corps controlled crossing area. As a result, the level of proficiency and training between maneuver unit and bridge planner would not be critical to the success of the operation.

One argument, centralization, applies to both option # 2 and option # 3. Centralization could complicate and thus adversely affect the conduct of combined arms training in river crossing operations. Maneuver divisions, now without an organic bridging unit, would have to coordinate with corps level for the support of training exercises. This problem is further complicated if the divisional bridge

company is moved away from the division post as a result of force drawdown or battalion command and control concerns. If the Army implemented Option # 2 or # 3, this problem could be resolved by leaving the bridge company located at the division post. As a result, peacetime training relationships could continue. As other corps units are already involved in divisional crossings, a strong and habitual training relationship between the bridge units and their divisions might reduce the impact of this issue.

THIRD CHOICE - **OPTION # 2:** This option fails to capitalize on the successes of option #1 and #3. Moving the company to corps but not incorporating it in the bridge battalion would do nothing to increase the training of individual soldiers, sections, or platoons. The current organization of the engineer brigade positions its bridge companies in dispersed locations, not in one central corps post. The ability to achieve economies of scale due to consolidation would not exist.

Additionally, moving the unit out of division would create the same training support problems to the maneuver brigade as earlier discussed under the corps battalion.

Another major problem alluded to earlier is that the absence of the bridge company in the division might further the mindset that engineers are the key players in river crossing operations. The sharpened focus that would occur within engineer units outside the division may be accompanied by an unintended and unfortunate reduction in

emphasis within the division.[6] Engineer doctrine highlights the importance of river crossing operations supporting the maneuver commander's intent. Total synchronization and coordination of all combat and combat support forces is essential. If the bridge company is "out of sight", will it also be "out of mind" of divisional engineer and maneuver planners? Although the capability of increased training might exist, a degradation in the ability of the maneuver brigade staff to plan river crossings would likely result.

6. **MAINTENANCE:** The maintenance aspect of the decision involves the centralization of bridging assets and availability of those assets in the forward support of actual bridging operations. What might be gained in the centralization of assets might be lost in flexibility and responsiveness of maintenance capability. While maintenance is a critical area, there are established procedures and regulations which can insure adequate maintenance support. The issue is the number of challenges posed by force structuring which leaders and maintainers must overcome. I will evaluate the options as they reduce or eliminate those challenges.

BEST CHOICE - **OPTION # 3:** Location of the bridge company in a co-located bridge battalion would consolidate like equipment, parts, and expertise. Economies of scale would be realized and cross-leveling of parts would be possible. The battalion would have a larger Prescribed Load List (PLL) as well as supporting Authorized Stockage Level

(ASL) of parts at the direct support level. The amount of time bridge equipment would be inoperable could be expected to decline as more assets would be available to repair them. More senior maintenance technicians, increased capability of the organic maintenance shops and battalion staff emphasis would further increase maintenance status.

The requirement to support bridge equipment would be dropped from the maneuver divisions. Similar to the low density of soldier skills, the division bridge company has unique, hard to maintain equipment. As a result, the drag on the engineer battalion and division maintenance shops would be reduced. The added burden of direct support maintenance would not significantly affect corps support commands as they are already servicing corps bridge units.

While improving maintenance status in peacetime, I would expect a decline in status during wartime. The location of all bridge equipment at corps level and corresponding shift of maintenance elements creates a void in repair capability. A maintenance support package from a corps unit would have to be formed and sent forward with the bridge company when it is employed. This relationship is inherently inefficient, and the requirement would offset to some degree the savings that are achieved by consolidating.[7]

SECOND CHOICE - **OPTION # 1:** Reversing the rationale used in the analysis of the corps bridge battalion results in the divisional company as the next choice. Without consolidation at corps, the divisional company is left to

its own resources and initiative to solve its low density maintenance problems. This is a workable solution proven by several if not all of the heavy division units currently maintaining their equipment without significant problems.

The advantage of this option is the ability to have a maintenance capability on the forward edge of the battlefield when needed during river crossing operations. If divisional or separate corps bridge equipment needs repair during the course of operations, divisional maintenance teams could perform limited rapid repair preventing serious loss of critical ribbon bridge bays. Division direct support assets are also much farther forward than the corps direct support assets needed in Option # 3.

THIRD CHOICE - **OPTION # 2:** As in my analysis on training, assignment of the bridge company as a separate company in the engineer brigade fails to capitalize on the advantages of Options # 1 and # 3. Although the brigade controls several bridge companies, their location on widely dispersed posts prevents economies of scale provided by maintenance consolidation. The unit would suffer the same challenges and limitations of the divisional battalion.

Like the centralization scenario of the corps battalion, this option lacks maintenance capability on the front line. Corps maintenance assets must be task-organized with bridge units to insure responsive repair capability.

7. **PLANNING CONSIDERATIONS:** The predictability and frequency of expected river crossing operations is critical

to the location of bridging assets. Highly predictable, low frequency crossing operations would support assets located at corps level. Conversely, unpredictable high frequency crossings would mandate positioning the company at division level. FM 90-13 highlights the doctrinal requirement for corps to identify major river crossings and provide assets. division must do detailed terrain analysis and rough crossing planning, and the brigade does detailed planning.

BEST CHOICE - **OPTION # 3:** Assignment of the divisional bridge company to the corps bridge battalion best satisfies this doctrinal relationship. In an AirLand Battle-Future environment of increased intelligence capability, river crossings will be known well in advance. The bridge battalion possesses the capability to predict and plan crossing operations and task-organize resources to support the maneuver unit. As a result, the centralization of ribbon bridge assets within the corps bridge battalion would be a feasible option based on the ability to predict, pre-plan, and provide the support if and when it is needed.

SECOND CHOICE - **OPTION # 1:** Although the assignment of the company to the bridge battalion takes full advantage of known water obstacles, the retention of an organic capability capitalizes on the ability to determine unknown and unexpected obstacles. The availability of bridging expertise and river reconnaissance within the division can assist in the rapid planning of frequent or unpredictable crossings. Brigade and division engineers familiar with

bridging requirements and possessing visibility of the future battle can plan far enough out to insure minimal disruption.

THIRD CHOICE - **OPTION # 2:** The assignment of the bridge company to corps would result in divisions losing the expertise to predict and plan for frequent, unexpected crossing operations. I discussed under command and control how the absence of an organic capability might result in a degraded sense of focus on river crossing operations. Brigade and division staffs might not identify future requirements for corps bridging assets or be late in requesting assistance from the engineer brigade. With the bridges out of the division but corps not responsible for the command and control of river crossing operations, problems might result in the early identification of water obstacles and required resources.

8. **MANEUVERABILITY OF HEAVY BRIGADES:** Important to the positioning of the bridge company is the impact on the strategic deployability and the tactical and operational maneuverability of the heavy division. I rank the options based on their ability to limit battlefield mobility and deployment sorties when river crossings are not anticipated.

BEST CHOICE - **OPTION # 2 and # 3.** The movement of the bridge company to corps level, either as a separate company or assignment to a bridge battalion, greatly improves the maneuverability of the division. Without being

able to differentiate between the two options, I will assign both of them a rank of 1.5.*

The removal of the bridge company from the division reduces the required number of sorties needed for strategic airlift. If a corps river crossing requirement exists, the increased logistical and operational staffs at corps level can coordinate the required deployment resources. A more likely scenario would be the employment by corps planners to pre-position assets in the theater of operations or use alternate means to cross the river. A wide range of corps aviation, airborne or airmobile units can be incorporated into the tactical plan as well as host nation bridging assets.

Shifting the bridge unit to corps level increases the maneuverability of the division on the battlefield. AirLand Battle-Future requires divisions to conduct rapid movements on the modern battlefield. Enhanced target acquisition systems and increased lethality of weapons systems will place a higher emphasis on survivability and mobility. The bridge company inhibits this rapid movement detracting from the very mobility it is designed to enhance.

THIRD CHOICE - **OPTION # 1:** There are no positive aspects of this option related to the maneuverability of the tactical unit.

The strategic deployability of the division is increased by removing the bridge company from the division. I previously highlighted the histories of Grenada, Panama,

and Desert Storm. When the tactical situation demanded rapid deployment, bridge companies stayed at home station. Large Air Force C-5 transport airplanes needed to move the 36 oversize bridge transporters and associated support boats and equipment were far too valuable to haul an asset not required.

Maneuverability on the ground is also improved. When river crossings are not expected, the bridge company would remain under division control and therefore not retard the maneuver brigade. However, the bridge company would add to the cumbersome and vulnerable combat service support tail formed by DISCOM units. When there are no major rivers in the area of operations, the impact of moving the unit around the battlefield will only provide the enemy targets and delay the overall mobility rate of the division.

UNWEIGHTED RECOMMENDATION:

Having ranked all the relative criteria with regard to the most supportable option, I will now apply the ranks to the decision matrix developed in Chapter Three. Those options best meeting the criteria are identified as 'BEST CHOICE' receiving a rank of 1. 'SECOND' and 'THIRD' choices will receive a rank of '2' and '3' respectively. Before the assignment of weights, it is beneficial to analyze the unweighted result.

UNWEIGHTED DECISION MATRIX

ENGINEER BRIDGE OPTIONS / CRITERIA	DIVISION BRIDGE CO RANK /	TOTAL	SEP CO. IN CORPS BDE RANK /	TOTAL	COMPANY IN CORPS BRIDGE BN RANK /	TOTAL
1. RESPONSIVE SUPPORT:	1 /		2 /		3 /	
2. OPTIMUM UTILIZATION:	3 /		2 /		1 /	
3. COMMAND AND CONTROL:	2 /		3 /		1 /	
4. BRIDGE VULNERABILITY:	2 /		1 /		3 /	
5. TRAINING:	1 /		3 /		2 /	
6. MAINTENANCE:	2 /		3 /		1 /	
7. PLANNING CONSIDERATIONS:	2 /		3 /		1 /	
8. MANEUVERABILITY OF HEAVY BRIGADE:	3 /		1.5 /		1.5 /	
OPTION TOTALS:		16.0		18.5		13.5

Calculating the sums of option ranks results in overall totals. Because the matrix is designed to 'minimize' the payoffs with the best option receiving the lowest score, the smallest overall total represents the recommended option. In the unweighted matrix, Option # 3 - **Assign the bridge company to the corps bridge battalion** is the recommended solution. The 2.5 point separation between

the three total scores signifies an adequate spread of values. On the weighted matrix outlining my particular set of values, I can perform a sensitivity analysis in needed to insure the solution is not changed by minor variations of individual weights.

INTERVIEW OF CGSC OFFICERS:

I interviewed numerous officers from the 1990-1991 Command and General Staff College to determine their priorities in river crossing operations. I provided each officer a detailed explanation of the problem and brief description of my three bridge company positioning options. I explained each decision matrix criterion and offered several possible weighting groups. Officers were asked to use their previous experience and tactical knowledge to assign weights which reflected the importance of the criteria. A copy of the interview is provided in Appendix A.

Officers were subdivided into two groups, maneuver and engineer. Twelve officers from the Infantry, Armor, and Field Artillery branch comprised the maneuver group. Twelve engineers completed the interview with results compiled and displayed in a separate section.

I limited the scope of the interview to the weighing of individual criterion. Interview weights were tabulated and averaged with the results applied to the decision matrix. Due to the complexity of the issues, I did not ask officers to individually rank options with regard to their

ability to satisfy criterion. My ranks of each criterion were used with the interviewed officer's weights applied.

For informational purposes, I included a section on the interview form for comments and recommendations on the final positioning of the bridge company. I provide those recommendations and comments in narrative summary.

MANEUVER OFFICER'S RECOMMENDATION:

Maneuver officers placed a high premium on elements of criterion which improved the ability of the tactical unit to project combat power across the water obstacle. **RESPONSIVE SUPPORT** and **COMMAND AND CONTROL** were ranked first and second. A detailed listing of weights and associated total rankings is provided below.

As I projected, elements associated with the internal workings of the bridge company (**TRAINING, MAINTENANCE, PLANNING CONSIDERATIONS**) were ranked low.

Comments from the maneuver officers reflected a strong desire for **RESPONSIVE SUPPORT.** Several reflected that even considering problems with vulnerability and maneuverability, bridge assets should be as far forward as possible. One officer stated that as a division commander he wanted the company in the division; if he were a corps commander, he would propose bridging assets centralized at corps level. This viewpoint raises the interesting question of where flexibility and the freedom to maneuver should be optimized, at division or corps level.

MANEUVER WEIGHTED DECISION MATRIX

ENGINEER BRIDGE OPTIONS \ CRITERIA	WEIGHT FACTOR	DIVISION BRIDGE CO RANK / TOTAL	SEP CO. IN CORPS BDE RANK / TOTAL	COMPANY IN CORPS BRIDGE BN RANK / TOTAL
1. RESPONSIVE SUPPORT:	3.50	1 / 3.50	2 / 7.00	3 / 10.50
2. OPTIMUM UTILIZATION:	2.00	3 / 6.00	2 / 4.00	1 / 2.00
3. COMMAND AND CONTROL:	3.17	2 / 6.34	3 / 9.51	1 / 3.17
4. BRIDGE VULNERABILITY:	2.17	2 / 4.34	1 / 2.17	3 / 6.51
5. TRAINING:	1.33	1 / 1.33	3 / 3.99	2 / 2.66
6. MAINTENANCE:	1.00	2 / 2.00	3 / 3.00	1 / 1.00
7. PLANNING CONSIDERATIONS:	1.67	2 / 3.33	3 / 5.01	1 / 1.67
8. MANEUVERABILITY OF HEAVY BRIGADE:	1.17	3 / 3.51	1.5 / 1.75	1.5 / 1.75
OPTION TOTALS:	16.00	30.35	36.43	29.26

Results from the decision matrix ranked Option # 3, **Assign company to Corps Bridge Battalion** as the recommended solution. The narrow margin between Option # 3 and Option # 1, however, highlights given a wide margin of error, either option could be adopted.

Several interesting comments were received from the interviewed officers as the officers were split on the disposition of the bridge company. 60% proposed leaving it

in the division to insure responsive support and flexibility to the maneuver units. The other 40% proposed moving the unit to a corps bridge battalion to permit maneuver brigades to focus on the battle. Most comments reflected that a river large enough to require bridging assets should be obvious enough to involve corps level assistance. Responsiveness would be traded for early task-organization of corps support forces and a tightly synchronized crossing plan.

ENGINEER OFFICER'S RECOMMENDATION:

Engineer officers reflected more understanding of the complexities facing engineer units during the conduct of river crossing operations. As might be expected, the weights reflected an increased importance of support to the bridge company and less concern over the impacts to the maneuver unit.

Several officers stressed the need for protecting vulnerable bridge assets from enemy fire. Maintenance of equipment and training of units received higher weights as did several maneuver related criterion.

ENGINEER WEIGHTED DECISION MATRIX

ENGINEER BRIDGE OPTIONS \ CRITERIA	WEIGHT FACTOR	DIVISION BRIDGE CO RANK / TOTAL	SEP CO. IN CORPS BDE RANK / TOTAL	COMPANY IN CORPS BRIDGE BN RANK / TOTAL
1. RESPONSIVE SUPPORT:	2.5	1 / 2.5	2 / 5.0	3 / 7.5
2. OPTIMUM UTILIZATION:	2.0	3 / 6.0	2 / 4.0	1 / 2.0
3. COMMAND AND CONTROL:	2.5	2 / 5.0	3 / 7.5	1 / 2.5
4. BRIDGE VULNERABILITY:	1.5	2 / 3.0	1 / 1.5	3 / 4.5
5. TRAINING:	1.0	1 / 1.0	3 / 3.0	2 / 2.0
6. MAINTENANCE:	2.0	2 / 4.0	3 / 6.0	1 / 2.0
7. PLANNING CONSIDERATIONS:	2.5	2 / 5.0	3 / 7.5	1 / 2.5
8. MANEUVERABILITY OF HEAVY BRIGADE:	2.0	3 / 6.0	1.5 / 3.0	1.5 / 3.0
OPTION TOTALS:	16.00	32.5	37.5	26.0

The engineer officers' averaged weights were not as widely dispersed as those of the maneuver officers'. This reflected a balanced priority between the needs of engineer and maneuver forces. The matrix totals reflect the desirability to **assign the bridge company to the corps bridge battalion.**

Narrative comments were mixed between Option #1 and Option #3. Officers addreessed the trade-off's between command and control, flexibility, and responsive support.

AUTHOR'S RECOMMENDATION:

The weights which I developed and justified in Chapter Three are included in my decision matrix. The rankings of individual criterion are incorporated reflecting the same data displayed in the maneuver and engineer matrices. The following data are provided for calculation.

AUTHOR'S WEIGHTED DECISION MATRIX

ENGINEER BRIDGE OPTIONS / CRITERIA	WEIGHT FACTOR	DIVISION BRIDGE CO RANK / /TOTAL	SEP CO. IN CORPS BDE RANK / /TOTAL	COMPANY IN CORPS BRIDGE BN RANK / /TOTAL
1. RESPONSIVE SUPPORT:	4	1 / / 4	2 / / 8	3 / / 12
2. OPTIMUM UTILIZATION:	2	3 / / 6	2 / / 4	1 / / 2
3. COMMAND AND CONTROL:	3	2 / / 6	3 / / 9	1 / / 3
4. BRIDGE VULNERABILITY:	1	2 / / 2	1 / / 1	3 / / 3
5. TRAINING:	1	1 / / 1	3 / / 3	2 / / 2
6. MAINTENANCE:	1	2 / / 2	3 / / 3	1 / / 1
7. PLANNING CONSIDERATIONS:	3	2 / / 6	3 / / 9	1 / / 3
8. MANEUVERABILITY OF HEAVY BRIGADE:	1	3 / / 3	1.5 / / 1.5	1.5 / / 1.5
OPTION TOTALS:	16.00	30.0	38.5	27.5

Option # 3, **Assignment of the divisional bridge company to a corps bridge battalion** has the lowest total of 27.5 importance points. Option # 1, **Retain in division**, is second with a slight increase in importance points. Finally, Option # 2, **Assign as separate company to engineer brigade** is a distant third.

I previously cautioned against the hazards of basing decisions strictly on quantitative results. Through consideration of the decision matrix I am able to make a recommendation. However, it is essential that I determine if that decision is supportable and defensible based on my overall knowledge of the problem. Although I will continue this subjective analysis in Chapter Eight, my initial reaction is that the recommendation correlates to the numerous lessons learned and conclusions identified throughout the paper.

READER'S INTERACTIVE DECISION MATRIX:

At this point in the analysis process I encourage the reader to devise your own weighting system to incorporate into the blank matrix provided. To insure consistency with the other decision matrices provided in this chapter, you must insure your weights total "16" importance points.

The ranks of each criterion I determined earlier in the chapter are provided to save time. You can revise any rank based on your own understanding and knowledge of the

bridge company and river crossing operations. To aid in completion of the matrix, I recommend reproducing the matrix.

READER'S WEIGHTED DECISION MATRIX

ENGINEER BRIDGE OPTIONS \ CRITERIA	WEIGHT FACTOR	DIVISION BRIDGE CO RANK / TOTAL	SEP CO. IN CORPS BDE RANK / TOTAL	COMPANY IN CORPS BRIDGE BN RANK / TOTAL
1. RESPONSIVE SUPPORT:		1 /	2 /	3 /
2. OPTIMUM UTILIZATION:		3 /	2 /	1 /
3. COMMAND AND CONTROL:		2 /	3 /	1 /
4. BRIDGE VULNERABILITY:		2 /	1 /	3 /
5. TRAINING:		1 /	3 /	2 /
6. MAINTENANCE:		2 /	3 /	1 /
7. PLANNING CONSIDERATIONS:		2 /	3 /	1 /
8. MANEUVERABILITY OF HEAVY BRIGADE:		3 /	1.5 /	1.5 /
OPTION TOTALS:	16.00			

CONCLUSION:

In this chapter I have provided a ranking of each criterion element and incorporated that rank into five separate matrices. Totals for each option have been calculated resulting in the following recommendations:

1. **UNWEIGHTED MATRIX.....OPTION # 3** - Corps Bridge Battalion.
2. **WEIGHTED MANEUVER MATRIX.....OPTION # 3** - Corps Bridge Battalion.
3. **WEIGHTED ENGINEER MATRIX.....OPTION # 3** - Corps Bridge Battalion.
4. **AUTHOR'S WEIGHTED MATRIX.....OPTION # 3** - Corps Bridge Battalion.

The four matrices I developed represent numerous viewpoints: weighted vs. unweighted, maneuver vs. engineer, and my views versus those of the interviewed officer. All four decision-making tools led the users to the same result **-move the bridge company to the corps bridge battalion.** With all models in agreement as to the recommended solution, I will abandon conducting a detailed sensitivity analysis.

I provided a blank matrix in the analysis to allow the reader to interact with the thesis and devise his own weights and ranks if desired. The results of the matrices will be further analyzed in Chapter Eight concluding with a final recommendation on the optimum positioning of the divisional bridge company.

CHAPTER SEVEN - ENDNOTES

[1]War Department, FM 100-5, Field Service Regulations -- Operations (1944): 59.

[2]Michael K. Collmeyer, "Gap Crossing Operations and the E-Force Concept," (Individual Study Project, U.S. Army War College, 1988), 21.

[3]Ibid, 20.

[4]Gordon M. Wells, "U.S. Army River Crossing Doctrine and AirLand Battle-Future," (School of Advanced Military Studies Monograph, U.S. Army Command and General Staff College, 1990), 35.

[5]Ibid, 25.

[6]Ibid, 30.

[7]Ibid, 27.

[8]Decision matrix procedures requires that equal options divide the total of their individual ranks. Option #2 and #3 receive a rank of 1.5, the result of 1 + 2 divided by 2.

CHAPTER EIGHT

CONCLUSION

> While AirLand Battle doctrine doesn't change the basic combat engineer missions, it places additional emphasis on the dimension of time. To contribute as a combat multiplier and true members of the combined arms team, combat engineers must be able to provide timely, responsive support to the maneuver commander. If, on the other hand, the maneuver commander must wait for his engineers, fleeting windows of opportunity on the battlefield are lost.[1]
>
> MG Richard S. Kem
> Commandant, U.S. Army Engineer School

OVERVIEW:

I have examined the research question of what force structure best positions the divisional engineer bridge company to support river crossing operations. Changes in engineer force structure, revised river crossing doctrine, changes in Army warfighting doctrine, and a need for a reduction in the active force have created on opportunity to research and recommend revision to bridge force structure.

In chapter one, I presented the background of the problem, stated assumptions, defined organizations, and developed three proposed bridge positioning options. Two of my options represent popular schools of thought: leave the

company in the division or assign it to the corps engineer brigade as a separate bridge company. As an additional option I examined the option of placing the company in a newly formed engineer bridge battalion. Chapter one set my parameters, expectations and stated purpose for conducting this research - to recommend to the senior engineer leadership the engineer bridge force structure which provides the best support for river crossing operations.

In chapter two, I provided a detailed review of existing published and unpublished literature to establish a baseline understanding of the available body of knowledge on the subject. I highlighted those sources which I found particularly useful in my analysis of historical perspectives, army doctrine, river crossing doctrine, and engineer force structure.

In chapter three I developed the thesis methodology. I established appropriate research questions and presented the most effective procedure for my analysis. I developed eight criteria which allow my three options to be subjectively judged in later chapters. I outlined my decision-making tool, the weighted decision matrix, which allowed me to effectively synthesize all criteria in order to arrive at a proposed solution. I completed the chapter by explaining an unweighted decision matrix and identifying four weighted matrices. These matrices represented my

views, those of maneuver and engineer officers, and those of the reader (data unavailable for consideration).

Chapter four is the first in a series of three chapters which provided an overall baseline understanding of the many complex issues involved in the research question. I began my historical analysis with a review of organizations, doctrines and actual operations of World War II. The efforts of bridge companies in the Korean War were presented in detail and followed by my analysis of bridging operations in the Vietnam theater. Low to mid-intensity operations conducted in Grenada, Panama, and Southwest Asia were reviewed with conclusions drawn on the feasibility of using ribbon bridge companies in contingency operations. I concluded the chapter by highlighting the significant doctrinal and force structure implications learned through past river crossing operations.

I reviewed both current and future warfighting and river crossing doctrine in Chapter five and drew important conclusions affecting my evaluation of bridge company options. I highlighted the changes between AirLand Battle and AirLand Battle-Future which will impact future river crossing operations. I reviewed revised river crossing doctrine and concluded that the new five phase doctrine supports AirLand Battle-Future by focusing on forces rather than terrain. I concluded by providing an overall analysis of how revised doctrine impacts the divisional bridge company.

In Chapter six, I completed my analysis of river crossing variables by examining three force structure issues. First, I reviewed major engineer force structure shortfalls which prevented effective bridge crossing support to the maneuver unit. Next, I explained the Engineer Restructuring Initiative concluding that ERI is a needed revision which improves engineer command and control within the brigade sector. I ended the chapter with an introduction to significant command and control advantages of assigning bridge companies to a corps bridge battalion. I also stated that while ERI improves the brigade engineer planning capability, this advantage is an independent issue from the assignment of the bridge company to division or corps.

In chapter seven I presented a thorough analysis of the options under consideration using the decision-making tools and criteria established in chapter three. Working through each element of criteria, I ranked the three options in their ability to satisfy the desired outcome of increased river crossing support. Once ranks were determined, I applied them to an unweighted matrix and three weighted matrices. Using the results gained from interviews with maneuver and engineer officers, as well as my own personal results, I arrived at a recommendation for positioning the bridge company. My decision-making procedure is validated as my unweighted matrix and the three independently weighted matrices produce the same recommendation.

CONCLUSION:

I recommend that the bridge company should be located at corps level under the control of a engineer bridge battalion. Upon reflection, this proposed solution best balances the challenges and limitations of doctrinal, force structure, and historical perspectives.

This structuring best supports the AirLand Battle-Future concept of centralized control and decentralized execution. The recommended solution best aligns with emerging river crossing doctrine where major river crossings are planned and resourced by corps level and conducted by divisions and brigades. The solution supports the Engineer Restructuring Initiative by creating leaner divisions while improving the command and control assets available to the maneuver brigade. The solution supports historical case studies where the centralization of bridge assets at corps, under an engineer command, increase the flexibility and operational freedom to maneuver of the corps commander.

I have shown through a detailed analysis that this option best satisfies the principles of war and the imperatives and tenets of AirLand Battle while adhering to the fundamentals and principles of river crossing doctrine. Given the assumptions and limitations I established early in the study, the assignment of the divisional bridge company to a corps bridge battalion best supports river crossing operations.

RECOMMENDATIONS:

1. **ASSIGN TO CORPS BRIDGE BATTALION:** In line with the logic and conclusions I established above, I recommend that the divisional bridge company be deleted from the heavy division force structure and added to the corps engineer brigade under control of a bridge battalion.

2. **CO-LOCATE WITH HEAVY DIVISION:** Although I highlighted some training and maintenance economies of scale realized by physically co-locating the battalion's bridge companies, I do not recommend physical consolidation. The conduct of frequent combined arms training with the heavy division far outweighs any advantages achieved in the areas of maintenance and collective training. As a result, I recommend that the divisional bridge company be physically positioned on the same installation as the heavy division. In addition to monetary savings realized by eliminating the need to move equipment and personnel, this arrangement facilitates training of maneuver units in the planning and conduct of river crossing operations. The bridge unit is not out of sight, it should not be out of mind.

3. **ECONOMIC LIMITATIONS:** This study excluded an economic analysis of the recommended options. I have completed my study based on designing a force structure which is effective, supports AirLand Battle and river crossing doctrine, and provides responsive support to the maneuver brigade. As a result, I may not have recommended the **cheapest** option.

Any revision which creates new organizations, requires additional overhead, and expands supervisory manpower levels without a corresponding increase in combat power will not likely be approved. With the active force shrinking by six divisions, I would predict the existence of at least three corps requiring a corps bridge battalion. Excluding the 565th Bridge Battalion in Europe, my recommendation would result in the creation of at least two additional battalion headquarters elements.

The conversion to ERI regiments, combined with the drawdown of the active force, can support the creation of the additional bridge battalions. I recommend, however, that if economic reasons prevent the increased force structure, my second selection - **retain the company in the division** - should be adopted. Without the advantage of increased command and control offered by the bridge battalion, the maneuver brigade will receive better support with a divisional bridge company than a separate corps unit.

SUGGESTIONS FOR FURTHER RESEARCH:

1. My research draws general conclusions about the ability of engineers to cross major water obstacles using current river crossing doctrine on the AirLand Battle-Future battlefield. An extensive study on the compatibility of the two doctrines is needed to validate current engineer river crossing procedures as described in FM 90-13.

2. Most of the research analyzing river crossing doctrine is based on the predictability and frequency of

water obstacles in the NATO theater. A study of future river crossing operations expected in a world-wide environment should be conducted to determine the validity of current doctrine in low to mid intensity conflicts.

CHAPTER EIGHT - ENDNOTES

[1]Richard S. Kem, "E-Force," Engineer (Spring 1986): 10.

APPENDIX A

MMAS Thesis Interview Form

1. **BOTTOM LINE:** In an effort to incorporate outside viewpoints into my thesis, I solicit your support in picking some relative weights for the eight criteria described below. The thesis will use decision matrices to the reflect weights of CGSC Engineer officers, CGSC Maneuver officers, and the author's opinion.

2. **OVERVIEW OF THESIS:** My study investigates the best location of the heavy divisional bridge company. Engineer and Maneuver proponents are proposing to move the unit to Corps but the issue has not been fully analyzed. I have outlined three options for analysis:

a. **Status Quo-Leave in Division.** This option provides one 144m bridge company in a heavy division organic to the new ERI or E-force engineer regiment. Command and control of river crossings remains a division requirement.

b. **Move to Corps-Separate Company.** Assign the company to corps as a separate bridge company. Would be task-organized to brigades as needed to support river crossings working under the control of the divisional engineer.

c. **Move to Corps-Bridge Battalion.** Assign to corps organic to a newly created corps bridge battalion within the engineer brigade. Battalion would control all separate bridge companies and coordinate corps controlled crossing areas for the divisions.

2. **REQUIREMENT TO WEIGHT CRITERIA:** The three options will be displayed in a decision matrix. To show a higher priority of one criteria over another, weight assignments will be made. I have given you 3 possible groups to choose weights from. The higher the number, the more significant that criteria will be on the eventual outcome.

Weight choice 1: 2,2,2,2,2,2,2,2	Equal weighting of criteria
Weight choice 2: 3,3,2,2,2,2,1,1	Moderate spread of Weights
Weight choice 3: 4,3,3,2,1,1,1,1	Wide spread of Weights

3. **REVIEW OF CRITERIA:** A brief description is provided. For clarification, ask the undersigned.

a. Responsive support: Bridge assets MUST be available when needed, not on call far back in the march column. Corps assets might get delayed.
b. Optimum Utilization: Bridge assets are short, all equipment must be used to speed crossing. Equipment left in division in reserve or without rivers in sector could prevent optimum use.
c. Command and Control: The hardest part of river crossing is organizing and synchronizing support and maneuver assets. Which option would facilitate the best Command structure?
d. Bridge Vulnerability: Bridges make good targets and are not well protected. Are division bridges vulnerable when no rivers are expected.

e. Training: Consolidating bridges at corps provide opportunity for centralized training yet reduces maneuver units familiarization.
f. Maintenance: Bridge assets are low density equipment. Consolidation at corps might improve maintenance in peace but hamper in time of war.
g. Planning Considerations: Most river crossing on future battlefields will be known in advance. Predictability provides flexibility. Because most divisional crossing need augmentation by corps bridge units, assigning the unit to corps would still provide time to task organize.
h. Maneuverability of heavy brigade: When not bridging, is the bridge company extra baggage which impacts the maneuver units ability to move on the battlefield and strategically deploy?

4. **DECISION MATRIX:** Pick one (1) weight grouping from above. Place the weights against the criteria below which you feel best reflects the importance of the criteria.

RESPONSIVE SUPPORT_____	OPTIMUM UTILIZATION_____
COMMAND AND CONTROL_____	BRIDGE VULNERABILITY_____
TRAINING_____	MAINTENANCE_____
PLANNING CONSIDERATION_____	MANEUVERABILITY ON _____ HEAVY BRIGADE

5. PERSONAL INFORMATION:

a. Please circle the appropriate branch category.

ENGINEER OFFICER MANEUVER OFFICER

b. Although not required, I would appreciate your 'GUT FEELING' of the best option. What structuring of the divisional bridge company (E Company) best supports river crossing doctrine?

LEAVE IN DIVISION MOVE TO CORPS SEPARATE COMPANY MOVE TO CORPS BRIDGE BATTALION

COMMENTS??_____

_____

_____

6. Thanks for your interest and participation. Please drop your results in my box in section 1. Your opinion and assignment of weights will be reflected in my thesis.

TODD T. SEMONITE
MAJOR, EN

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